

# The 3<sup>rd</sup> International Conference

of Multidisciplinary Approaches on UN  
Sustainable Development Goals (UNSDGs 2018)

December 28<sup>th</sup> – 29<sup>th</sup>, 2018

at the Hotel Windsor Suites & Convention, Bangkok, Thailand

Organized by



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VERSITÄT



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# **Proceedings**

**The 3<sup>rd</sup> International Conference of Multidisciplinary  
Approaches on UN Sustainable Development Goals  
UNSDGs 2018, Bangkok, Thailand**

**Nakhon Pathom Rajabhat University**

## **Program and Abstracts**

**The 3<sup>rd</sup> International Conference of Multidisciplinary Approaches on UN Sustainable Development Goals On UN Sustainable Development Goals  
UNSDGs 2018 December 28th – 29th, 2018, Bangkok, Thailand**

**Co-hosted by:** 1. Nakhon Pathom Rajabhat University  
2. The Interdisciplinary Network of the Royal Society of Thailand under the Royal Patronage of Her Royal Highness Princess Maha Chakri Sirindhorn  
3. Office of the Higher Education Commission  
4. Faculty of Environment and Resource Studies, Mahidol University  
5. Faculty of Nursing, Prince of Songkla University  
6. The Thai Public Health Nurses' Association under the Royal Patronage of Her Royal Highness Princess Galyani Vadhana Krom Luang Naradhiwas Rajanagarindra  
7. Center for Research and Development in Community Health System, Faculty of Nursing, Khon Kaen University  
8. Thailand TESOL Teachers of English to Speakers of Other Languages  
9. University of Kassel, Germany  
10. Universitas Pendidikan Nasional (Undiknas University), Indonesia  
11. College of Nursing, Hungkuang University  
12. Faculty of Buddhist Studies (Buddhist & Pali University of Sri Lanka)

**Editors:** 1. Asst.Prof.Dr.–Ing.Phatcharasak Arlai  
2. Dr.Udsanee Pakdeetrakulwong  
3. Miss Ladda Khemnark  
4. Miss Sirikorn Kitkongphana

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**Available online at:** <http://dept.npru.ac.th/unsdgs2018>



### **Message from President of Nakhon Pathom Rajabhat University**

The 3<sup>rd</sup> International Conference of "Multidisciplinary Approaches on UN Sustainable Development Goals" (UNSDGs) is the third academic international conference of Nakhon Pathom Rajabhat University. On behalf of the president of Nakhon Pathom Rajabhat University, I am delighted to host and co-host with 11 organizations including Faculty of Environment and Resource Studies, Mahidol University, Faculty of Nursing, Prince of Songkla University, The Interdisciplinary Network of the Royal Society of Thailand under the Royal Patronage of Her Royal Highness Princess Maha Chakri Sirindhorn, Office of the Higher Education Commission, The Thai Public Health Nurses' Association under the Royal Patronage of Her Royal Highness Princess Galyani Vadhana Krom Luang Naradhiwas Rajanagarindra, Center for Research and Development in Community Health System, Faculty of Nursing, Khon Kaen University, Thailand TESOL Teachers of English to Speakers of Other Languages, College of Nursing, Hungkuang University, Faculty of Buddhist Studies (Buddhist and Pali University of Sri Lanka), University of Kassel, Germany and Universitas Pendidikan Nasional (Undiknas University), Indonesia.

The aims of UNSDGs is to provide a forum for academicians and professionals from various educational fields and with cross-disciplinary interests to network, share knowledge and engage in dialogue around the theme of fostering innovation and excellence in multidisciplinary approaches on UN sustainable development goals to produce a set of universally applicable goals that balances the three dimensions of sustainable development: environmental, social, and economic.

I would like to take this opportunity to express my sincere appreciation to Professor Emeritus Chalong Kirdpitugsa, Professor Emeritus Dr. Warren Y. Brockelman, Dr. Charles E. Harris, many distinguished international and Thai academicians that have presented their important research works, the conference organizing committees and all supporters who have contributed their resources to the conference with a great determination. Last but not least, I would also like to thank the working team who delicate themselves to achieve the conference.

In conclusion, I am honor to express my heartfelt appreciation to all participants, especially those of you coming from abroad, for joining us and sharing your valuable experience and ideas and wish our visitors will enjoy the conference and have a very pleasant stay in Thailand.

(Dr. Wirat Pinkaew)  
President of Nakhon Pathom Rajabhat University





**Message from  
Chairman of the Interdisciplinary Committee  
for Research and Development  
of the Royal Society of Thailand**

On behalf of the Chairman of the Interdisciplinary Committee for Research and Development of the Royal Society of Thailand, we have co-worked with Nakhon Pathom Rajabhat University since 2011. Herewith the President of Nakhon Pathom Rajabhat University performs as a Chairman of Western Network of the Royal Society of Thailand.

Since then, we have cooperated for publishing Journal of Thai Interdisciplinary Research until now and I am the Editor of Journal of Thai Interdisciplinary Research.

In the present, Journal of Thai Interdisciplinary Research is indexed in the tier 1 (Science and Technology) of TCI, ASEAN Citation Index (ACI) and Google Scholar.

Moreover, the conference is mainly hosted by Nakhon Pathom Rajabhat University and the Interdisciplinary Committee for Research and Development of the Royal Society of Thailand. The selected articles will be published on the Journal of Thai Interdisciplinary Research.

Finally, I would like to express the deep appreciation to plenary lectures, keynote speakers, all participants and working staffs whom devote themselves to this conference.

I further wish the 3<sup>rd</sup> International Conference of Multidisciplinary Approaches on UN Sustainable Development Goals (UNSDGs) to be a great success and wish all participants a pleasant stay in Thailand, to have extensive and successful academic exchanges on the importance of interdisciplinary research from the conference, and safe trip back home.

(Professor Dr.med. Yongyudh Vajaradul, FRST)  
Chairman of the Royal Society of Thailand

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## Conference Program

### The 3<sup>rd</sup> International Conference of Multidisciplinary Approaches on UN Sustainable Development Goals (UNSDGs 2018) December 28<sup>th</sup> – 29<sup>th</sup>, 2018 at the Hotel Windsor Suites & Convention, Bangkok, Thailand

Conference Program on December 28 <sup>th</sup> , 2018 (Day 1)	
Date/Time	Description
08.30 - 09.00	Registration
09.00 - 09.15	<b>Conference Opening</b> <u>Report</u> : Dr. Wirat Pinkaew, President of Nakhon Pathom Rajabhat University, Thailand <u>Welcome Speech</u> : Prof.Dr.med. Yongyudh Vajaradul, Chairman of the Interdisciplinary Committee for Research and Development of the Royal Society of Thailand <u>Opening Speech</u> : Mr. Prasit Pathumarak, Chairman of Nakhon Pathom Rajabhat University Council, Thailand
09.15 – 09.30	Presenting a Token of Appreciation for Plenary Lecturers and Conference Co-organizers
09.30 -10.30	<b>Plenary Lecture 1</b> : Prof. Emeritus Chalong Kirdpitugsa Topic: Drought Crisis in B.C. 2536 in Chao Phraya River Basin, Bangkok will be shortage for raw water supply: How to holistically solve this drought crisis in the future?
10.30 – 11.30	<b>Plenary Lecture 2</b> : Prof. Emeritus Dr. Warren Y. Brockelman Topic: Conservation and research on gibbons in Khao Yai National Park
11.30 - 12.30	<b>Plenary Lecture 3</b> : Dr. Charles E. Harris Topic: An insulin-friendly lifestyle for optimal health and the prevention of hyperinsulinemia, metabolic dysfunction, and insulin disease
12. 30 - 13.30	Lunch
13.30 - 17.30	Keynote Address / Oral Presentation
18.00 - 20.00	Welcome Dinner
Conference Program on December 29 <sup>th</sup> , 2018 (Day 2)	
Date/Time	Description
08.30 - 09.00	Registration
09.00 - 12.00	Keynote Address / Oral Presentation
12.00 - 13.00	Lunch
13.00 – 15.00	Presentation (Continue)

Remark: Activities schedule may be changed as appropriate

# **Oral Presentation Program**



<b>AMPAWA 1 (Fl.10)</b>		
<b>Session:</b> Sustainable Development Goals		
<b>Session Chair:</b> Prof. Dr. med. Yongyudh Vajjaradul		
<b>Dec 28<sup>th</sup>, 2018</b>		
<b>Time</b>	<b>Code</b>	<b>Title</b>
13.30 - 13.45	SDGs 1	<b>Economic globalization, human rights, and child neglect: Are the paradigms providing for children's well-being?</b> by Paul DuongTran and Nha Trang T. Nguyen
13.45 - 14.00	SDGs 2	<b>Estimating welfare benefits of 'Diyatha Uyana' wetland park in Sri Lanka</b> by Wasantha Rathnayake and Sangeetha Lakshani
14.00 - 14.15	SDGs 3	<b>Needs of using Google Docs in EFL classroom</b> by Wipanee Pengnate
14.15 - 14.30	SDGs 4	<b>Praxial interdisciplinary education and enquiry: Developing quality education at a Thai international college</b> by Charlton Bruton
14.30 - 14.45	SDGs 5	<b>Expanding roles of nursing in Taiwan SDGs</b> by Yann-Fen Chao
14.45 - 15.00	SDGs 6	<b>Financial returns of implementing a circular economy: A firm's perspective</b> by Pard Teekasap
15.00 - 15.15	SDGs 7	<b>Can migration solve income inequality problem?</b> by Pard Teekasap
15.15 - 15.30	SDGs 8	<b>The correlation of empowerment, work-life balance and quality of life of women at community enterprise, Nakhon Pathom province</b> by Chalermkwan Singhwee
15.30 - 15.45	SDGs 9	<b>Sustainable development goals (SDGs) project and the use of QR CODE for local products development by student's community service learning (CSL)</b> by Nopparat Kantapikul and Punnda Hunchaisri

<b>BOARDROOM 1 (Fl.G)</b>		
<b>Session:</b> Pure and Applied Science		
<b>Session Chair:</b> Assoc. Prof. Dr. Jakrapong Kaewkhao, Asst. Prof. Patarawagee Yasaka, and Dr.Piyachat Meejitpaisan		
<b>Dec 28<sup>th</sup>, 2018</b>		
<b>Time</b>	<b>Code</b>	<b>Title</b>
13.30 – 14.30	<b>Keynote Speaker</b>	<b>Asst. Prof. Dr. Juniastel Rajagukguk</b> <b>Topic: " Technology of nanocomposites: Synthesis, characterization and application of Fe<sub>3</sub>O<sub>4</sub>/Ppy/CNTs "</b>
14.30 - 14.45	SCI 1	<b>Technology adoption and sustainable livelihood outcomes of farmers producing ethanol feedstocks in Thailand: A qualitative insight</b> by Wirawat Chaya, Shabbir H. Gheewala, and Sudarut Tripetchkul
14.45 - 15.00	SCI 2	<b>Structural correlation using XANES and EXAFS analysis on Dy<sup>3+</sup> doped phosphate luminescent glasses</b> by R. Rajaramakrishna, M. Shoaib, C. Saiyasombat, G. Rooh, R. Botta, N. Nuntawong, and J. Kaewkhao
15.00 - 15.15	SCI 3	<b>Spectroscopy characteristics of Eu<sup>3+</sup> doped zinc barium tellurite oxyfluoride glasses for laser materials</b> by P.Yasaka, Y.Yamsuk, J.Keawkao, and N.Sangwaranateec
15.15 - 15.30	SCI 4	<b>Study on physical, optical and luminescence of zinc tellurite glasses doped with bismuth oxide</b> by P.Yasaka, S.Sribunrueng, S.Sivanavin, and J.Keawkao

<b>BOARDROOM 1 (Fl.G)</b>		
<b>Session: Pure and Applied Science</b>		
<b>Session Chair:</b> Assoc. Prof. Dr. Jakrapong Kaewkhao, Asst. Prof. Patarawagee Yasaka, and Dr.Piyachat Meejitpaisan		
<b>Dec 28<sup>th</sup>, 2018</b>		
<b>Time</b>	<b>Code</b>	<b>Title</b>
15.30 - 15.45	SCI 5	<b>Intermittent warming affects postharvest Physicochemical quality and Physiology of ‘Holland’ papaya fruits</b> by Alex B. L. Ongom, Pat Pranamornkith , and Thamarath Pranamornkith
15.45 – 16.00	SCI 6	<b>Physicochemical properties, total phenolic content and antioxidant activities of aloe vera beverages</b> by Sumeth Piayura, Chompoonuch Khongla, Wichuda Klaweche, Jirayu Musika, and Chutikarn Kapcum
16.00 – 16.15	SCI 7	<b>Attenuation coefficients of problock and red brick for gamma ray shielding applications</b> by K. Seingsanor, W. Hongtong, W. Chaiphaksa, and J. Kaewkhao
16.15 – 16.30	SCI 8	<b>NIR emission of Nd<sup>3+</sup> -doped sodium barium borate oxyfluoride glasses for 1.07 μm laser materials</b> by Piyachat Meejitpaisan, Khwanporn Phothong, and Jakrapong Kaewkhao

<b>BOARDROOM 2 (Fl.G)</b>		
<b>Session: Pure and Applied Science</b>		
<b>Session Chair:</b> Assoc. Prof. Dr. Jakrapong Kaewkhao, Asst. Prof. Patarawagee Yasaka, and Dr.Piyachat Meejitpaisan		
<b>Dec 28<sup>th</sup>, 2018</b>		
<b>Time</b>	<b>Code</b>	<b>Title</b>
14.30 – 14.45	SCI 9	<b>Comparative study of radiation shielding properties for clay bricks and autoclaved aerated concrete bricks</b> by Pruittipol Limkitjaroenporn, Wiraporn Hongtong, Kittipong Siengsanoh, and Jakrapong Kaewkhao
14.45 – 15.00	SCI 10	<b>Effect of alkali metal on properties of aluminum barium phosphate glasses system</b> by N. Chanthima, N. Kiwsakunkran, and J. Kaewkhao
15.00 – 15.15	SCI 11	<b>Investigations of the optical, physical and radiation shielding properties of the tungsten sodium borate glasses in the range of 1 keV to 100 GeV</b> by W. Chaiphaksa, C. Wongdeeying, W. Cheewasukhanont, and J. Kaewkhao
15.15 – 15.30	SCI 12	<b>Physical and luminescence properties of rare earth doped phosphate glasses for solid state lighting applications</b> by M. Shoaib, N. Chanthima, G. Rooh, R. Rajaramakrishna, and J. Kaewkhao
15.30 – 15.45	SCI 13	<b>Visible luminescence of Sm<sup>3+</sup> ions in lithium strontium borate glasses</b> by Keerati Kirdsiri, Benchaporn DamDee, and Jakrapong Kaewkhao
15.45 – 16.00	SCI 14	<b>Comparative study of SiO<sub>2</sub> in biomass ashes at different temperatures</b> by Watcharin Rachniyom, Nattapon Srisittipokakun, and Jakrapong Kaewkhao
16.00 – 16.15	SCI 15	<b>Physical, optical and luminescence properties of sodium barium bismuth borate glasses doped with dysprosium ions</b> by Nattapon Srisittipokakun, Pornnapha Mangthong, and Jakrapong Kaewkhao
16.15 – 16.30	SCI 16	<b>Study properties of Cr<sub>2</sub>O<sub>3</sub> dope in glasses prepared from sugar cane ash</b> by Nattapon Srisittipokakun, Nakarin Singkiburin, and Jakrapong Kaewkhao

<b>BOARDROOM 3 (Fl.G)</b>		
<b>Session: Electrical Engineering and Computer Technology</b>		
<b>Session Chair:</b> Assoc.Prof.Dr.Piya Kovintavewat, Asst. Prof. Dr. Santi Koonkarnkhai, Asst. Prof. Dr.Supoj Hengpraprom Dr. Worachet Uttha, Dr. Pitiphol Pholpab, Dr. Udsanee Pakdeetrakulwong, and Mr. Suksawat Sae-Lim,		
<b>Dec 28<sup>th</sup>, 2018</b>		
<b>Time</b>	<b>Code</b>	<b>Title</b>
13.30 – 14.30	<b>Keynote Speaker</b>	<b>Assoc. Prof. Dr. Jaturong Tantibundit</b> <b>Topic:" Artificial intelligence in medicine: Research and innovation"</b>
14.30 - 14.45	EET 1	<b>Spectrum allocation scheme on multi-user MIMO cognitive radio systems</b> by Rattasat Laikanok, Krittaya Nakprasit, and Suwaphat Kadjantuk
14.45 - 15.00	COM 2	<b>The development of database system for alumni via web application</b> by Surin Aunsan, Pannarat Wongpattananipa, and Chovalit Covirawong
15.00 - 15.15	COM 3	<b>Risk assessment of Thai users disclosed Facebook's data privacy in each generation</b> by Phatcharaporn Thiensawat and Chanattha Chansutthirangkool
15.15 - 15.30	COM 4	<b>Data mining model and application for stroke prediction: A combination of demographic and medical screening data approach</b> by Sotarath Thammaboosadee and Teerapat Kansadub

<b>PLOY (Fl.11)</b>		
<b>Session: Medical Health Sciences and Laws</b>		
<b>Session Chair:</b> Dr. Prasutr Thavornchaisit and Dr. Orapun Metadilogkul		
<b>Dec 29<sup>th</sup>, 2018</b>		
<b>Time</b>	<b>Code</b>	<b>Title</b>
09.00 – 10.30	MED 1	<b>Cultural variance in healthy literacy and perceived positive health in Viet Nam and Thailand</b> by Paul DuongTran, Chitsirin Laikak, Quoc-Phuong Nguyen, Kingkeaw Samsuruan, and Nha Trang Nguyen
10.30 - 10.45	MED 2	<b>Clinical efficacy of the hair tissue-based therapy in the treatment of male androgenic alopecia</b> by Puttida Puttacharoenlarp, Saranyoo Ponnikorn, and Suparuj Lueangarun
10.45 - 11.00	MED 3	<b>Risk estimation in outbreak investigation: A simulation study comparing risk estimates obtained from generalized linear models applied to high-incidence dichotomous outcome</b> by Chanapong Rojanaworarit and Jason J. Wong
11.00 - 11.15	MED 4	<b>The strategic movement in health science's curriculum toward the professional development view: A case study of Thai dental school</b> by Sutti Sooampon
11.15 - 11.30	MED 5	<b>Sustainable development and intellectual property</b> by Lisa P Lukose
11.30 - 11.45	MED 6	<b>An insulin-friendly lifestyle for optimal health and the prevention of hyperinsulinemia, metabolic dysfunction, and insulin disease</b> by Charles Harris

<b>AMPAWA 2 (Fl.10)</b>		
<b>Session: Nursing</b>		
<b>Session Chair:</b> Assist. Prof. Dr. Hathaichanok Buajaroen, Assist.Prof.Dr. Pimsupa Chandanasotthi, Assist.Prof.Dr.Vanida Durongrittichai, Asst. Prof. Warangkana Saisit Ms. Natthaya Cherngchalard, Ms.Labmie Lynnette Dematoque, Ms.Laarnie D.Esteban, Mrs. Ruffel Joy C. Manalo, Mrs. Maria Cecilia C.Rerez, , Ms. Wanpen Waelveerakup, and Ms. Duangporn Phasuwan		
<b>Dec 28<sup>th</sup>, 2018</b>		
<b>Time</b>	<b>Code</b>	<b>Title</b>
13.30 – 14.30	<b>Keynote Speaker</b>	<b>Prof. Yann-Fen Chao</b> <b>Topic: " Expanding Nurse Roles of Taiwan in the nursing education of SDGs"</b>
14.30 – 15.30	<b>Keynote Speaker</b>	<b>Prof. Shu-li Chen</b> <b>Topic: " Nursing education evidences to support sustainable development goals "</b>
15.30 –15.45	NUR 1	<b>Effectiveness of smoking cessation program applying the transtheoretical model among students of Siam University</b> by Payungsak Jantrasurin, Duangkamol Viroonudomphol, and Wattanee Panjinda
15.45 –16.00	NUR 2	<b>Improving self-care behavior for caregivers of elderly at Baan Bangkhae social welfare development center</b> by Pornpimol Poomlittikul and Duangkamol Viroonudomphol
16.00 –16.15	NUR 3	<b>The effect of Nei-Guan Acupressure on reducing postoperative nausea and vomiting in patients after surgery</b> by Ming-Shan Jan, Tzu-Ying Li, and Shih-Hsin Hung
15.15 - 15.30	NUR 4	<b>Exploring the home experiences of parents caregiving for children with medical complexity: A qualitative synthesis</b> by Shu-Chen Hung and Shu-Ling Chen
15.30 - 15.45	NUR 5	<b>Exploring cancer patients’ family caregivers views of cancer patients’ choice of hospice</b> by Shou-Yu Wang, Men-Jin Chen, and Ying-Ying Chang
15.45 – 16.00	NUR 6	<b>Understanding women’s experience of recovering from anorexia nervosa</b> by Shu-Ling Chen, Cheng-I Yang, and An-Chyi Chen
16.00 – 16.15	NUR 7	<b>Concept mapping VS OSCE and simulation training</b> by Li-Chiu Lin, Shu Yang, Kuang-Hsia Yuan, Shao- Po Huang, and Shu-Hu Wang
16.15 – 16.30	NUR 8	<b>Screening of high-risk mental state individuals: A cross-sectional study on nursing college students</b> by Der-Yun Hsiung, Ching-Lun Tsai, Ling-Chun Chiang and Wei-Fen Ma
16.30 – 16.45	NUR 9	<b>Comparison of impulse oscillometry and in spirometry in childhood?</b> by Liang-Mei Lin, Yi-Giien Tsai, Lon-Yen Tsao, and Tsay-I Chiang
16.45 – 17.00	NUR 10	<b>Application acute post-care reduce in heart failure patients with 30-day readmission emergency room</b> by Lai, wen-chen

<b>AMPAWA 2 (Fl.10)</b>		
<b>Session: Nursing</b>		
<b>Session Chair:</b> Assist. Prof. Dr. Hathaichanok Buajaroen, Assist.Prof.Dr. Pimsupa Chandanasotthi, Assist.Prof.Dr.Vanida Durongrittichai, Asst. Prof. Warangkana Saisit Ms. Natthaya Cherngchalard, Ms.Labmie Lynnette Dematoque, Ms.Laarnie D.Esteban, Mrs. Ruffel Joy C. Manalo, Mrs. Maria Cecilia C.Rerez, , Ms. Wanpen Waelveerakup, and Ms. Duangporn Phasuwan		
<b>Dec 29<sup>th</sup>, 2018</b>		
<b>Time</b>	<b>Code</b>	<b>Title</b>
09.00 – 10.30	<b>Keynote Speaker</b>	<b>Topic: Further SDGs in Community, Gender, Health, and Nursing Reform</b> <b>1. Assoc. Prof. Dr. Karnsunaphat Balthip</b> <b>2. Asst. Prof. Dr. Pimsupa Chandanasotthi.</b> <b>3. Asst. Prof. Dr. Nanthaphan Chinlumprasert</b>

<b>AMPAWA 2 (Fl.10)</b>		
<b>Session: Nursing</b>		
<b>Session Chair:</b> Assist. Prof. Dr. Hathaichanok Buajaroen, Assist.Prof.Dr. Pimsupa Chandanasotthi, Assist.Prof.Dr.Vanida Durongrittichai, Ms. Natthaya Chergchalard, Ms.Labmie Lynnette Dematoque, Ms.Laarnie D.Esteban, Mrs. Ruffel Joy C. Manalo, Mrs. Maria Cecilia C.Rerez, Asst. Prof. Warangkana Saisit, Ms. Wanpen Waelveerakup, and Ms. Duangporn Phasuwan		
<b>Dec 29<sup>th</sup>, 2018</b>		
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10.30 - 10.45	NUR 11	<b>The effectiveness of interventions for improving breast self-examination behaviors among adult women: A systematic review and meta-analysis</b> by Saimai Tumwijit, Sulee Tongvichean, Sudruk Chitthathairatt, Abdulkareem S. Iblasi
10.45 - 11.00	NUR 12	<b>The challenges of global nursing education on nurse migration related issues: An integrative overview</b> by Ruffel Joy Manalo
11.00 - 11.15	NUR 13	<b>Effects of basic life support training program for village health volunteers: A quasi experimental study</b> by Wanpen Waelveerakup
11.15 - 11.30	NUR 14	<b>The impact of the implementation of republic act no. 10912 - philippine continuing professional development (CDP) act the Filipino registered nurses</b> by Labmie Lynnette L. D and Labmie Kristine M. Labastilla
11.30 - 11.45	NUR 15	<b>Effective behavioral interventions for smoking cessation in the primary care setting: A meta-analysis</b> by Kamollabhu Thanomsat, and Jintana Yunibhand
11.45 - 12.00	NUR 16	<b>Assessment tools for incontinence-associated dermatitis (IAD): A literature review</b> by Nifatin Sulaiman and Chantra Promnoi
13.00 - 13.15	NUR 17	<b>Development of clinical nursing practice guideline for promoting recovery of elderly patients with total knee arthroplasty</b> by Wilawan Nakpalad, Natenapha Khupantawee, and Hathairat Sangchan
13.15 - 13.30	NUR 18	<b>Development of the belief in treatment effectiveness scale for adults with chronic low back pain</b> by Benyapa Prompuk, Wanchai Lertwatthanawilat, Tipaporn Wonghongkul, Khanokporn Sucamvang, and Torphong Bunmaprasert,

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14.00 - 14.15	HUM 3	<b>Measuring the environmental costs of offshore wind energy development: Results from a choice experiment survey</b> by Hyo-Jin Kim and Seung-Hoon Yoo
14.15 - 14.30	HUM 4	<b>The need to nurture future builders of nations</b> by Que Huu Le

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<b>Session Chair:</b> Prof. Dr.Budsaba Kanoksilapatham, Assoc. Prof. Dr. Sita Yiem- Kantong, Assoc. Prof. Dr. Singhanat Nomnian, Asst.Prof.Dr.Pragasit Sitthitkul, Assist. Prof. Dr. Usa Noytim, Assist. Prof. Dr. Kamonpan Boonkit, Asst. Prof. Dr. Piyaporn Tunneekul, Ms. Duangjit Sukhapabsuk, Mr. Surachai Yusuk, and Mr. Nupong Phusri		
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14.45 - 15.00	HUM 6	<b>English adjective order ability by L2 Thai learners</b> by Patchanok Kitikanan and Supakan Dandamrongrak
15.00 - 15.15	HUM 7	<b>Do L2 experience, type of affix and motivational factors relate to affix knowledge in L2 English learning?</b> by Patchanok Kitikanan and Jiratthitikarn Supantana
15.15 - 15.30	HUM 8	<b>ESP course design in EFL classroom</b> by Ruja Sukpat, Netnapa Suaysi, and Nattakrita Boonbongkotrat
15.30 - 15.45	HUM 9	<b>Authentic assessment, what and why authentic assessment</b> by Pranee Seenak and Nupong Phusri
15.45 - 16.00	HUM 10	<b>Influencing factors for study master's degree of Nakhon Pathom Rajabhat University students</b> by Wisit Rittiboonthai, Darin Photangtham, Thongchai Pongsittikanchana, and Wassana Bootpo
16.00 - 16.15	HUM 11	<b>Difficulties in learning grammar of business English students at Nakhon Pathom Rajabhat University</b> by Duangjit Sukhapabsuk

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<b>Session: Environmental Engineering and Science</b>		
<b>Session Chair:</b> Prof. Dr. Warren Y. Brockelman, Assoc. Prof. Dr. Tuantan Kitpaisalsakul, Assoc. Prof. Dr. Sayam Aroonsrimorakot, Asst. Prof. Dr. Phatcharasak Arlai, and Dr. Meena Laiphrakpam		
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14.00 - 14.15	ENV 3	<b>Gap analysis of environmental management system standard ISO14001:2015 conformity of a large school in Nakhon Pathom, Thailand</b> by Kijtiphong Sukarom, Sayam Aroonsrimorakot, and Saranya Sucharitkul
14.15 - 14.30	ENV 4	<b>Participation and awareness of staff in the office that apply green office standard under the principle of grounded theory</b> by Adisorn Russameepong and Sayam Aroonsrimorakot
14.30 - 14.45	ENV 5	<b>Environment management system assessment ISO14001:2015 of Honda car service center</b> by Dusit Songtrakulsak and Sayam Aroonsrimorakot
14.45 - 15.00	ENV 6	<b>Counting gibbons: The evolution of sample methods</b> by Warren Y. Brockelman
15.00 - 15.15	ENV 7	<b>Factors affecting the efficiency of applying the green office principles in organization</b> by Chonticha Korattana, Sayam Aroonsrimorakot, Chumlong Arunlertaree, and Anong Hambananda

<b>AMPAWA 3 (Fl.10)</b>		
<b>Session: Environmental Engineering and Science</b>		
<b>Session Chair:</b> Prof. Dr. Warren Y. Brockelman, Assoc. Prof. Dr. Tuantan Kitpaisalsakul, Assoc. Prof. Dr. Sayam Aroonsrimorakot, Asst. Prof. Dr. Phatcharasak Arlai, and Dr. Meena Laiphrakpam		
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<b>MORAKOT 2 (Fl.12)</b>		
<b>Session: Hospitality and Tourism Management</b>		
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14.30 - 14.45	TOUR 1	<b>Potential ways creative health tourism activities in the Pathom Asoke community, Nakhon Pathom province</b> by Pimpaga Raitongrunroj, Phanida Rungboon, Rattiya Puangmee, Nathakorn Pinsang and Pimchanok MoonMit
14.45 - 15.00	TOUR 2	<b>Development of participatory cultural tourism management strategies case study of Baan Huay Hin Dum community, Amphoe Dan Chang, Suphanburi</b> by Chiranuch Sopha, Rugsiri Chunhaphantarak, and Kanjarat Rattanasonthi
15.00 - 15.15	TOUR 3	<b>The development of Chiang Khan community identity for promoting tourism in the area</b> by Wantakan Seemarorit
15.15 - 15.30	TOUR 4	<b>The perspective of elderly tourist guides on the local communities development in Koh Lad E-Tan subdistrict, Nakhon Pathom province</b> by Suthaporn Chayarathee, Prapon Leksuma, Intira Kulwichain, Sasithida Saraiwong, Wareerat Lao-aroon, Lalana Pathomchaiwat, and Kanoknate Worawong
15.30 - 15.45	TOUR 5	<b>The study of factors that affect making decision of agro-tourism at Klong Mahasawat community, Putthamonthon district, Nakhon Pathom province</b> by Suratsavadee Maungpan, Sutida Riwsomboon, Prapapan Boonsanong, Napath Ngenwises, Nilubon Kongprem
15.45 – 16.00	TOUR 6	<b>Guidelines for developing evaluation criteria of tourism trend indicators in capturing, tasting and sharing in Nakhon Pathom province</b> by Wannarat Paekeaw, Anuwat Nulsin, Sirikanya Bunnun and Thanawat Dokchan
16.00 – 16.15	TOUR 7	<b>The study for a public relation media development guideline to promote the agro-tourism of Huai Muang communities, Kamphaeng Saen district, Nakhon Pathom</b> by Metpreeya Bannakani, Niphawan Saengworrat, Kunnika Laddawon, Thanisorn Kasetomboon and Tirana Pratum
16.15 – 16.30	TOUR 8	<b>The development of organic agritourism route connection in Ban Hua Ao community, Sam Phran district, Nakhon Pathom province, to promote tourism potential</b> by Tanaporn Rungmanee, Patimakan Pongma, Sawitthaya Sroiraya, Porntuch Thetruang, Prapon Leksuma, and Nipon Chuamuangphan



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16.30 – 16.45	TOUR 9	<b>Guidelines for the quality development of historical sites in Wat Phra Pathom Chedi Ratcha Wora Maha Wihan, Muang district, Nakhon Pathom province</b> by Channarong Phuttaowat, Peeraporn Paolae, Yossawadee Purngthong, Wanisa Yuenwong, and Wongrawit Nomnumsab
16.45 – 17.00	TOUR 10	<b>The guideline of elderly tourist guides curriculum development for Koh Lad E-Tan subdistrict, Nakhon Pathom province</b> by Wareerat Lao-aroon, Intira Kulvichian, and Lalana Pathomchaiwat
17.00 – 17.15	TOUR 11	<b>Tourism demand in Nakhon Pathom for the development of revisit tourism destinations in Nakhon Pathom province and the connected areas</b> by Nipon Chuamuangphan, Prapon Leksuma, Pimchanok Mulmit and Nilubon Kongprem
17.15 – 17.30	TOUR 12	<b>The comparative study of cultures between ASEAN and the plus three countries</b> by Nattapol Pourprasert

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<b>Session: Buddhism for Thailand 4.0</b>		
<b>Session Chair:</b> Assoc.Prof.Dr.Chamnan Rodhetbhai, Asst. Prof. Dr. Warakorn Poonsawat, Mr. Yanapat Yodkaew, Mr. Narongwan Boonma, and Dr. Sorawit Wongsaaard		
<b>Dec 28<sup>th</sup>, 2018</b>		
<b>Time</b>	<b>Code</b>	<b>Title</b>
13.30 – 14.30	<b>Keynote Speaker</b>	<b>Prof. Samantha Ilangakoon</b> <b>Topic: "Socially Engaged Buddhism based on Sarvodaya in Sri Lanka and the philosophy of sufficiency economy in Thailand"</b>
14.30 - 14.45	BUD 1	<b>The Satja savings group in accordance with the teachings of Buddhism: Case study on the Satja savings group in Nakhon Pathom province</b> by Patcharee Kwangkeearee
14.45 - 15.00	BUD 2	<b>Health promotion activity development following Buddhist concepts for community health in Leam Bua sub-district, Nakhon Pathom</b> by Piyanart Imdee
15.00 - 15.15	BUD 3	<b>Religious approach on peace, justice and strong institutions for sustainable development</b> by Charith Priyadarshana
15.15 - 15.30	BUD 4	<b>An analytical study of Vipassanā meditation teaching according to S.N. Goenka</b> by Ram Chandra Kahar and Praepat Yodkaew
15.30 - 15.45	BUD 5	<b>A sacrifice dance to Phra Pathommachedi Pagoda in Nakhon Phathom province of Thailand</b> by Praepat Yodkaew
15.45 – 16.00	BUD 6	<b>The principles of social development in Theravada Buddhist philosophy</b> by Narongwas Boonma
16.00 – 16.15	BUD 7	<b>A study on problems and challenges faced by people due to Uma Oya water multi-purpose development project (UMDP) in Badulla district</b> by Ven Omalpe Somananda
16.15 – 16.30	BUD 8	<b>The study on participated factors in community development activity for elementary students of Prongmadua sub-district, Muang Nakhon Pathom, Nakhon Pathom province</b> by Phitcha Buayaem

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16.30 – 16.45	BUD 9	<b>An integrated learning management to cultivate volunteer spirit of students: Case study of Nakhon Pathom Rajabhat University</b> by Piyanart Imdee, Thongchai Srimuang, Suphapiech Siriporn Na Ratchasima
16.45 – 17.00	BUD 10	<b>Buddhist psychological approaches to peace and harmony from the Madhupiṇḍika Sutta</b> by Supun Kaluarachchi

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09.00 – 10.30	ITR 1	<b>Special education and social work practice: Considerations for pedagogy and practice in Asia and U.S.</b> by Paul Duongtran, Hang Phuong Nguyen, and Buncha Samruayruen
10.30 - 10.45	ITR 2	<b>Non-English major undergraduate students' perception towards using English songs in foreign language classroom: A case of Thai–Nichi institute of technology</b> by Pisit Jittisukpong
10.45 - 11.00	ITR 3	<b>Hyperspectral imaging assessment of diabetic foot skin tissue feasibility study</b> by Lin Lin Lee, Shu-Ling Chen, and Nian-Shen Chen
11.00 - 11.15	ITR 4	<b>A study of EFL learners' satisfaction towards online learning</b> by Kornthip Ratanapumma and Bundit Anuyahong
11.15 - 11.30	ITR 5	<b>Social, religious, recreational and medicinal usage of cannabis in India and Thailand</b> by Sayam Aroonsrimorakot and Meena Laiphrakpam
11.30 - 11.45	ITR 6	<b>Value added product development for oyster farmers' group in Kung Krabaen bay royal development study center, Chanthaburi</b> by Duanrung Benjamas
11.45 - 12.00	ITR 7	<b>Determinants of cognitive impairment among adults aged 50 years and older in the communities of Thailand</b> by Orawan Jetwarapong, Orapin Laosee, and Aroonsri Mongkolchati
13.00 - 13.15	ITR 8	<b>Mathematics teaching in basic education in Thailand by integrating STEM-waldorf technique to increase students' achievement and inspiration in learning</b> by Amarin Apirakmas
13.15 - 13.30	ITR 9	<b>The ability of various yeast strains to ferment alcohol from waste rambutan (Nephelium lappaceum Linn) fruit</b> by Duanrung Benjamas
13.30 – 14.30	ITR 10	<b>An analysis of the TOEIC test taking ability and needed skills for improvement of undergraduate students in Private University</b> by Bundit Anuyahong
14.30 - 14.45	ITR 11	<b>The relationship of quality of work life among the staff at Photharam hospital</b> by Wisit Rittiboonthai, Darin Photangtham, Hathaichanok Buajaroen, and Surasaek Phonghanyudh
14.45 - 15.00	ITR 12	<b>Factors affecting the loan pattern of member of savings cooperative of SCG packaging Co., Ltd.</b> by Wisit Rittiboonthai, Monruedee Phutti , Chaianant Panyasiri, and Pawana Bumrungsuk

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# Plenary Abstracts

# **The system study for increasing of water management efficiency in the Chao Phraya River basin by mathematical model**

Chalong Kirdpitugsa<sup>1,\*</sup>

<sup>1</sup>Emeritus Professor at Department of Water Resources Engineering, Faculty of Engineering, Kasetsart University

## **Abstract**

The water resources development in large river basin may usually be composed of large reservoir upstream and irrigation area downstream. One irrigation area can receive water supply from one or more than one reservoirs or joint water uses. Therefore, water management during flood period, normal period and during dry period are rather complicated. The mathematical models are usually applied for better water management. They are : Effective rainfall models for rice and other crops growing, Irrigation demand model, Model to forecast inflow into the reservoir and to forecast side flow or uncontrol flow at the important location in the river basin, The river system simulation model for water balance study and Weekly water scheduling model etc. Lot of field data collection are needed for some period of times for model calibration. After model application is carried on, water uses efficiencies will be increased. The application of these models to the Chao Phraya-Mekong basin as systematic study, which had been applied during the years B.E. 2522-2525, are explained. In the future, it is recommended to bring this model to be used again. And if this model is applied and the flood in the year B.E.2554, will be taken place again, the large flood peak from Nakornsawan to Samut prakarn provinces can be reduced. And if the dry year such as the year B.E.2536 will be taken placed in the Chao Phraya river basin again, Bangkok may be not shortage of raw water for producing water supply.



# **Presented Full Paper**

# **Session of Sustainable Development Goals**

# Needs of using Google Docs in EFL classroom

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## Abstract

The purposes of this research were 1) to study needs of using Google Docs in an EFL classroom and 2) to study supplemental opinions and suggestions of the students. The research samples were 219 first year students at Thai-Nichi Institute of Technology in the 2016 academic year. This sample was selected using the Simple Random Sampling technique. The instrument used to gather the data was a questionnaire with a rating-scale and open-ended questions. Statistics used to analyze the data were frequency, percentage, mean, standard deviation and content analysis.

The research findings were: 1) TNI students had high needs for using Google Docs in EFL classroom; 2) Some of the students' suggestions were for Google Docs to provide a greater variety of assignments. They also suggested that students should be able to submit assignments anywhere and anytime, writing assignments should be based on updated stories or news. They also suggested that they were not confident when other students can look up their course mates' writing.

**Keyword:** Google Docs, EFL classroom, English-Teaching Learning Process, EFL Teaching-Learning Approach

## I. INTRODUCTION

Recently, the role of technology has effected on our lives in various forms. Technology is being used by children and adults on a daily basis by way of web surfing, texting, social networking, interactive games, and in more ways [1]. Thus, it is significant to focus on technology as one of effective learning tools in this technological society.

Then, the needs of using technology in EFL learning might be an essential channel to deliver knowledge to the students. This might lead to higher levels of motivation, engagement, learning and performance in learning [2]. In this case, that the activities should be focused on student perceptions of task value and self-efficacy, social ability, instructional design issues, and quality of the delivery system and multimedia instruction [3].

The popularity of cloud-based applications among students and educational institutions is rapidly increasing due to applications learning through mobile tools. These enhance free sharing features and accessibility, which support effective instruction. The advantages of using cloud-based platforms cause many researchers to investigate the educational values and educational settings through this technological advancement [4].

Google Docs, therefore, might support collaboration in EFL teaching-learning as it provides ability to share and edit documents between group members. It also allows teachers and students to share a draft where they can instantly edit and saves them from the students' mobile phone. [5]-[6].

Consequently, it is vital for English Department, College of General Education and Languages, Thai-Nichi Institute of Technology to place Google Docs in EFL learning activities as it erases issues of geographical boundaries, making it easier to work from any location in the world [7].

## II. RESEARCH PURPOSES

The purposes of this research were

- 1) To study needs of using Google Docs in EFL classroom
- 2) To study supplemental and suggestions

## III. RESEARCH METHODOLOGY

### A. Population and Samples

Population of this research was 1200 first year TNI students in 3 faculties of Engineering, Information Technology and Business Administration in the first semester of 2016 academic year. Samples of the research were 219 students who enrolled in English for Communication 1 course, derived through Simple Random Sampling technique. The instruments used for gathering the data were the rating-scale and open-ended questionnaire. The statistics used for analyzing the data were frequency, percentage, mean, standard deviation, and content analysis.

### B. Instrumentation

The instrument used in this study is a questionnaire. The first part of this questionnaire asks for the demographic information on their genders and faculties.

The second part concerns a study of needs of using Google Docs in EFL classroom. This part comprises 10 items. The five levels of opinions used in the questionnaire are "The highest needs", "High needs", "Moderate needs", "Low needs" and "The lowest needs". Responses from the student questionnaires were subsequently coded. The data of the students' coded responses were statistically calculated and analyzed. The computation of Cronbach's Alpha as a measure of reliability was employed to indicate how reliable the research questionnaire results are. Reliability is defined as the proportion of the students' responses to each item in the questionnaire and the reliability coefficient or calculated alpha is a lower bound of the true reliability of the research instrument, or the questionnaire. The descriptive statistics is

also used to determine the individual summary statistics for each of the 10 items in the questionnaire.

The third part asks for suggestions and opinions which based on open-ended questions.

### C. Data Analysis

Data analysis from questionnaire both single item and whole questionnaire which presented a form of rating scale. These rating scales were calculated to find out mean and standard deviation and then translated based on criteria developed by Best (1981) as follows:

$1.00 \leq \bar{x} < 1.50$  refers to the lowest needs.

$1.51 \leq \bar{x} < 2.50$  refers to low needs.

$2.51 \leq \bar{x} < 3.50$  refers to moderate needs.

$3.51 \leq \bar{x} < 4.50$  refers to high needs.

$4.51 \leq \bar{x} < 5.00$  refers to the highest needs.

The collected data was analyzed using a computer program. The statistics used for analyzing the data were frequency, percentage, mean, standard deviation, and content analysis.

## IV. RESULTS

### A. Phase 1 The results of demographic variable of TNI undergraduate students

The analysis of the data from the students' questionnaire reported by TNI students in the 2016 academic year is presented in the 2 section deals with the demographic variables from the students' responses to Part 1 of the questionnaire: genders and faculties as a following table.

TABLE I. TABLE OF THE RESULTS OF DEMOGRAPHIC DATA OF RESPONDENTS

DEMOGRAPHIC DATA OF RESPONDENTS	n=219	PERCENTAGE
<b>1. Genders</b>		
1.1 Male	107	48.86
1.2 Female	112	51.14
<b>Total</b>	<b>219</b>	<b>100</b>
<b>2. Faculties</b>		
2.1 Engineering	68	31.05
2.2 Information Technology	79	36.07
2.3 Business Administration	72	32.88
<b>Total</b>	<b>219</b>	<b>100</b>

Table showed that percentages of TNI undergraduate respondents in genders ranged from 48.86% for male and 51.14% for female. For faculties, 31.05% were Engineering students, 36.07% were Information Technology students and 32.88% were Business Administration students.

### B. Phase 2 The results of needs of using Google Docs in EFL classroom

TABLE II. TABLE OF MEAN AND STANDARD DEVIATION OF NEEDS OF USING GOOGLE DOCS IN EFL CLASSROOM

No.	ITEMS		S.D.	LEVEL
1	I prefer Google Docs more than paper assignments.	4.05	0.59	High
2	I prefer paper assignments more than Google Docs.	4.20	0.63	High
3	Google Docs encourage me to write in English.	3.85	0.74	High
4	Google Docs help improve my writing in English.	4.02	0.71	High
5	Google Docs motivate me to submit assignments on time.	3.37	0.62	Moderate
6	Sharing my work with other students increase my motivation to write.	4.27	0.64	High
7	Giving other students' feedback helps improve my writing.	4.15	0.57	High
8	Getting feedback from other students help improve my writing.	4.00	0.55	High
9	Google Docs make revising and editing paper easier.	4.59	0.59	Highest
10	Google Docs help me write higher quality writing drafts.	4.31	0.74	High
<b>Total</b>		<b>4.38</b>	<b>0.63</b>	<b>High</b>

The table above indicated that TNI students had high level of needs of using Google Docs in EFL classroom in overall ( $\bar{x} = 4.38$ ). When considered in each aspect, it was found that the students had the highest level of item 9 "Google Docs make revising and editing paper easier." ( $\bar{x} = 4.59$ ), followed by item 10 "Google Docs help me write higher quality writing drafts." ( $\bar{x} = 4.31$ ). However, the least needs at a moderate level was item 5 "Google Docs motivate me to submit assignments on time." ( $\bar{x} = 3.37$ ).

### C. Phase 3 The results of opinions and suggestions strategies of Thai-Nichi Institute of Technology students

The suggestions from the respondents were listed as follows:

- 1) Google Docs are required to provide more varieties of assignments;
  - 2) It is important for students to submit assignments anywhere and anytime;
  - 3) Writing assignments should be based on updated stories or news; and
- It might not be confident for students to submit their writing when other students can check and edit others' writing

4) It might not be confident for students to submit their writing when other students can check and edit others' writing.

## V. DISCUSSION AND CONCLUSION

According to the findings, it was found that the highest needs of the students were to make revising and editing their paper in easier way through Google Docs. This is related to the study of Hunter [8] who notes that writing practices using Google Docs appears to hold the potential to enhance technology-based collaboration skills. However, in order to engage students in meaningful collaboration, teachers should inform students of the shared goals and benefits of collaborative writing, which correspond to classroom objectives, and provide optional training in peer feedback and collaboration strategies. This is similar to the notion of Liu & Lan [9] who study the difference in motivation, vocabulary gain and perceptions on using Google Docs between individual and collaborative learning at a tertiary level. Thus, Google Docs has shown tremendous pedagogical potential among non-native English speaking communities, where students have found Google Docs to have predominantly positive impact on their learning.

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# Praxial interdisciplinary education and enquiry: Developing quality education at a Thai international college

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## Abstract

The following paper explores issues related to quality international education using an interdisciplinary approach that combines third generation Human Resource Development, Contemplative Education, Applied Linguistics, and Cognitive Science. The main objective of this research was to better understand an international campus context by having participants (students) explore their interlanguage communication experiences. The specific aims were: (i) to develop quality education through interdisciplinary and integrated enquiry; (ii) for students to gain transformative insights into their cross-cultural experiences (Rehorick & Bentz, 2009); (iii) to develop cross-cultural communicative intentionality (Tomasello, 2014). The significance of this research relates to the inadequate documentation of students' and instructors' formal and informal campus experiences, and to the lack of interdisciplinary practitioner classroom research in International Higher Education. Both areas are crucial for developing quality international education. Subsequently, phenomenological data was collected during regular classroom instruction as students explored their interlanguage communication experiences. In addition, hermeneutic interpretations and analysis indicated that students improved their cross-cultural communication while constructing meaningful knowledge as contributing members of the international community.

**Keyword:** contingency, integrative, interdisciplinary, educational praxis

## I. INTRODUCTION

For evidential reasons, educational research that is *contextual*, *relational*, and *interdisciplinary* has the capacity to transform teaching and learning into *quality* education [3]. Moreover, interdisciplinary research deepens our understanding of the interconnections between teaching, learning, and the human relationships involved in educational processes. In this research, Human Resource Development (HRD) and Contemplative Education guide the qualitative inquiry, while Applied Linguistics and third generation Cognitive Science provide a more theoretical approach. Nonetheless, interdisciplinary research while being convergent, may diverge in parts, requiring a *facilitation* to reconverge the diverging parts. This *facilitation* can be maintained using practitioner research that allows researchers to position themselves inside the context as *knowers* who understand and are familiar with background nuances. Thus, allowing teachers to develop quality education.

Quality Education, according to the UN includes “knowledge and skills needed to promote [...] sustainable development and sustainable lifestyles, human rights, gender equality, promotion of a culture of peace and non-violence, global citizenship and appreciation of cultural diversity and of culture’s contribution to sustainable development” [4]. Accomplishing quality education in cross-cultural learning environments, requires a commitment to intercultural communication competence and principles by cultivating communicative intentions. Communicative intentions can be explored and promoted at three levels; (i) individual intentionality, (ii) shared intentionality, and (iii) collective intentionality [2].

## The Problem

International Higher Education lacks normative structures and practices that help develop quality education through sustainable lifestyles and equality. International education is a social construction, with assembled diversity, creating an unnatural cultural setting that lacks a dominate language and cultural. Consequently, establishing a common campus culture, and common language is an essential requirement for developing sustainable quality education. In international education, student sub-groups have a tendency to reflect common languages making it difficult to create a common *lingua franca* that naturally merges from the subgroups. In many cases students are using English for the first time, and struggle socializing and learning in a second language (L2).

Although these L2 learners’ native language was determined by birth, and acquired contextually through supportive interlocutors, their target language is experienced decontextualized in foreign language classrooms where individual intentions lack joint and collective intentions. Moreover, without a suitable community of inquiry [5]. This creates a difficult arrangement for L2 students who are left to their own intentions which are typically non-conducive to language acquisition & development [6].

This creates a community of L2 students who predominately use their native language for socialization, and lack communicative intentionality in the target language. Subsequently, newcomers form groups with compatriots, and seldom use the target language in social settings. Therefore, international colleges must be proactive in creating new *interlanguage* communities of inquiry through dialogical and experiential learning. From this approach, language acquisition, learning, and development can emerge from

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subjective and objective fields to form intersubjective fields that increase connectivity, and minimize disparities [7].

Notwithstanding, L2 learners have limited communicative intentionality, and lack the necessary intentions to learn in the target language. As a result, learning *everyday* and *scientific* concepts in the target language requires a revised teaching approach with activities based on experiential learning, allowing students to transform from their new experiences [8]. Moreover, there is a contingency and interdependence within language, as viewed from second and third generation cognitive science [9] which designates language experiences as crucial requirements for L2 acquisition, learning, and development [6].

### *The Solution*

Within language experiences there are contingencies associated with the nature of language that make knowledge management and self- development dependent on how students respond, interpret, and understand the world [6]. After all, humans are hardwired for cooperation, being interdependent, and dependent on communication [2]. Therefore, it is through contemplation, cooperation, and compassion that international L2 learners gain support necessary to develop communicative intentionality which eventually leads to Basic Interpersonal Communication Skills (BISC) and Cognitive Academic Language Proficiency (CALP) [10].

As L2 usage and communicative intentionality increases, international students in International Higher Education (IHE) change and transform, with a reciprocal effect on their community. Subsequently, communicative intentionality, classroom relationships, and affordances become central aspects for international teachers & students to consider when using English as a Medium of Instruction (EMI). Therefore, less focus should be on language form, and more on pragmatic functions, interlanguage dialogue and relationships [6].

Equally noteworthy, teachers and their international students using EMI typically disregard these areas while attending to curriculum, product, outcomes, and grades. Unfortunately, focusing on outcomes and grades are especially unfavorable as international colleges become narrowed by curriculum and technology in place of teacher- student interactions. Regardless, EMI classrooms can be significantly improved by cultivating communicative intentionality (CI) and interlanguage participation while expecting the outcomes stakeholders were anticipating.

Nevertheless, developing CI at the college level is difficult and problematic due to international college students' peculiar conflicts with *Identity* and *Self* [11]. In international EMI settings where authentic opportunities to use the target language are limited, second language acquisition (SLA) relies on teacher/student interactions at joint commitment levels [2]. This can be challenging for international students who are learning academic content in a decontextualized classroom where students lack both Basic Interpersonal Communication Skills (BICS) and Communicative Academic Language Proficiency (CALP) [10].

Students confronted with difficult challenges need proactive support in the areas of *Identity* and *Self* which can be implemented through Human Resource Development

initiatives [12]. Essentially, International colleges are socially constructed, and bare the responsibilities to prepare students for the unnatural, interlanguage settings that they desire to create. To expect students to have the aptitude and to create interlanguage communities of inquiry and learning is irresponsible, and could be damaging to unprepared learners. Curriculums must focus on changes in classrooms that contextualize language learning.

To contextualize classrooms and make them more conducive to language learning & development, activities should coincide with humans' unique cognitive infrastructure that manifests in joint commitments [2]. According to the cognitive linguist Michael Tomasello, language is non-instinctual, developing from individual, shared, and collective intentionality, or what Tomasello calls an instinctual desire to communicate [2]. However, these characteristics are seldom cultivated in classrooms due to traditional L2 teaching practices that focus on form over function, and technology in place of interaction [6].

In order to explore and make meaning from the experiences and voices in international classrooms, we must choose research methods supported by worldviews that are suitable for as many voices involved. Invariably, experiences and voices change with each context, and it is crucial that educators combine their approach to longstanding ancient wisdoms that are enduring, those in agreement with "*the Golden Rule: do not do to others what you would not have done to you*" [13].

Learning and development in International Higher Education, as in all contexts, are contingent on students' ability to engage, inquire, and reflect on academic content as it relates to their prior knowledge and experience [8]. Nonetheless, for authentic engagement to take place, students must be given the time and space to explore academic content from various perspectives; subjective, intersubjective, and objective.

To promote this type of inquiry, learning and development, *Praxial Interlanguage Education and Enquiry* (PIE) was designed for the purpose of assisting international students' pursuit of knowledge in an *English as Medium of Instruction* (EMI) setting. The PIE model allows students to explore the academic content through *Contemplative Education: contemplation, compassion, and contingency*, leading to learning and development at individual, shared, and collective levels that can sustain a community of English learners.

PIE is an ongoing interdisciplinary research project that links teacher and student development to pedagogical improvement through the exploration and understanding of students' classroom experiences. With a theoretical foundation based on *groundlessness*, PIE views *Contemplative Education, Pragmatics, and Embodied Cognition* as lenses to conduct interdisciplinary research and development. The aim of PIE is to improve classroom practice at International Colleges in Thailand, where local Thai speaking students attempt to learn academic content using *English as the medium of instruction* (EMI) with the aid of Content and Language Integrated Learning (CLIL).



## II. LITERATURE REVIEW

Establishing a conceptual foundation is crucial for interdisciplinary research that is intended to improve, develop, and transform communities and institutions [12]. Subsequently, research must be transformative as well, by engaging and accommodating human experience [9:12]. Without this engagement, development and transformation become distant and out of reach. Currently, there remains a gulf between *first-person* inquiry and *third-person* knowledge, but the gulf has been bridged through interdisciplinary science that combines cognitive science, phenomenology, and Buddhism [9]. Varela et al., explored this through *enaction* that understands the world as a combination of a lived body, mind, and environment [9].

Universities can lead in these areas by engaging contextual problems at local and community levels by extending disciplinary boundaries. This can be achieved through participatory science. Known as “people’s science”, Participatory Action Research (PAR) generates and constructs knowledge through a dialogical process with the people being researched, and not in connection to Cartesian or Kantian rationality [14]. Through praxis, academic knowledge is combined with popular knowledge to obtain a more accurate picture of the context being researched, and in the process foster improvement and change [14:12].

In this manner, participative science can impact local and world problems while linking interdisciplinary social inquiry with social action that can transform curriculum, individuals, teaching, and science [12]. Designed for community and educational research, PAR can be used in classrooms to explore issues concerning teaching, learning, and curriculum by collecting subjective, intersubjective, and objective data during classroom experiences. PAR has had partnerships with Higher Education for decades, mainly to train teachers and educational personnel [12].

Education that is interdisciplinary and integrative, attempts to combine *learning*, *development*, and *transformation*, requires a sustainable community committed to research, reflection and dialogue [15]. And as many educators know, having a sustainable community of like-minded practitioners is dependent on proactive commitments from the top down [16]. Nonetheless, in the absence of community commitments, educators must find their own justifications for combining learning, development, and transformation. As Gadamer, aptly wrote: “the concept of self-formation, education, or cultivation (*Bildung*), which became supremely important at the time, was perhaps the greatest idea of the eighteenth century, and it is this concept which is the atmosphere breathed by the human sciences of the nineteenth century, even if they are unable to offer any epistemological justification for it” [17].

Such a position echoes the stance of Kuhn, whose usage of *tacit knowledge and intuition* seem related to Heidegger [18]. Notwithstanding, much of the human sciences have been influenced by the phenomenological and existential views of Husserl, Heidegger, and Merleau-Ponty, who gave credence to the importance of subjective insights, and the forerunners of hermeneutic, interpretive and community-based knowledge [9: 12: 5].

Nonetheless, for the importance of community consensus, we can venture further back to the *Axial* age when newly formed communities tried to mitigate negative beliefs through *contemplation* and the *golden rule* [13]. Moreover, others have turned to “people’s science”, Participatory Action Research (PAR) for justification. PAR has the ability to generate and construct knowledge through a dialogical process with the people being researched which is resistant to Cartesian or Kantian rationality [14]. Through praxis, academic knowledge is mixed with popular knowledge to obtain a more accurate picture of the context being researched to foster improvement and change [14: 12]. In this manner, participative science can impact local and world problems while linking social inquiry with social action which can result in transformations at different levels from curriculum to individuals, teaching, and science [12]. This can be beneficial for interdisciplinary education where emphasis should be placed on human development rather than material wealth [12]. Designed for community research that includes education, PAR can be used in classrooms to explore issues concerning teaching, learning, and curriculum by collecting subjective, intersubjective, and objective data during classroom experiences.

PAR has had partnerships with Higher Education for decades, mainly to train teachers and educational leaders in areas of instructional design, praxis achievement, and transformative learning [19]. With links to PAR, Transformative Learning is generally associated with teaching that results in change, and the ways in which typically adult students view their world. Generally speaking, transformative learning takes place through dialogical or communicative learning as learners examine their experiences from a critical perspective [19]. Based on his original transformative research, Mezirow identified 10 phases in transformative learning; (1) a disorienting dilemma; (2) self-examination; (3) critical assessment of assumptions; (4) transformation coming from disorientation; (5) exploration of new roles and relationships; (6) planning action; (7) gaining knowledge and skills for the plan; (8) trying out new roles; (9); building competence and self-confidence in new roles; (10) solidifying new life. These 10 phases can easily be used by students to explore their own experiences in relation to the academic content.

In an attempt to simplify Transformative Learning, Mezirow & Taylor identified three core elements in transformative learning: (1) individual experience; (2) critical reflection; (3) and dialogue, but over the years it has expanded to include; a holistic orientation; awareness of context; and authentic practice [19]. This allows for transformative learning to be actualized in the classroom, opening corridors for instructors to design activities suitable for any context.

In addition, participatory forms of Action Research (PAR), along with Transformative Learning, act as guides for teachers and students to explore academic topics as they relate to their own unique experiences. For students, this is invaluable, giving students the needed time to reflect on the core concepts, from self-interest to humans’ natural interdependence and our need to feel connected [20]. Moreover, through the research of Piaget, Erikson, and Kegan, instructors can gain a better understanding of students’ limitations, and the difficult stages they go through in a fast

changing world [11]. For instance, according to Erikson's Psychosocial Theory of Development, university students struggle with their identity, social role, and expectations in ways that can be debilitating [11]. While Kegan a professor at Harvard Graduate School of Education sees connecting students' roles to their long term aspirations to foster engagement, motivation, and common ground that helps students make sense of their environment [21].

Without fostering engagement and common ground, students may construct limited and incomplete understandings that don't reflect current cognitive science [2]. These misunderstandings reflect a reductive view that doesn't include a thorough view of individual ontogeny and human phylogeny by casting human cooperation as selfishness [2]. So flawed is this misconception that Tomasello proposed the Interdependence Hypothesis, a two-step human process that includes intersubjective or joint collaboration to cultural-level or collective intentionality that evolved to solve social problems [2]. Essentially, this strikes a chord against misunderstood implications of Survival of the fittest, and the self-driven interests of corporate success [20]. Moreover, recent embodied or enactive cognitive theories reinterpret Survival of the fittest to Survival through collaboration that demonstrates an integrated approach to interdisciplinary research and education that encourages social responsibility [22]. If interdisciplinary instructors are not proactive in this area, there is a risk that students will learn to associate survival most often with selfishness at the detriment of altruism, resulting in a misunderstanding of the two [20].

#### *contemplation, Compassion, & Contingency*

At the individual level, *international* students find themselves in EMI classrooms where they struggle to recognize and contextualize unfamiliar sounds, and unrecognizable patterns with the academic content. For those students who lack language awareness, the task is nearly unachievable, and while International Colleges try to support students with their social endeavors, the task of developing basic language skills through academic content is problematic. Accordingly, *international* students must be proactive outside the classroom to develop adequate speaking, listening, reading, and writing skills, but few are inclined to do so. Subsequently, students experience slow progression which at times resembles digress. To overcome this, students must gain language awareness at multiple levels that includes self-awareness, both internal and external which requires self-reflection and self-cultivation. Moreover, many students don't possess these attributes, and must be supported by instructors who understand and are sympathetic to their dilemma. Essentially, the individual level is not enough to sustain student development, yet they are tasked with learning and developing communicative intentionality at three levels: individual, shared, and collective [2]. To accomplish language awareness, PIE uses *contemplation, compassion, and contingency*. In its application, language awareness has the potential to foster students' communicative intentionality, but teachers must allow students the time and space to explore their experiences [15]. While some instructors may not support such intrusions, assigning experiential activities that encourage self-cultivation is in the tradition of *Bildung* which

Gadamer praised as the greatest idea of the eighteenth century [17]. Helping students become self-cultivating can be accomplished through integrative education and experiential learning [15]. Through self-reflection we discover our own limitations, and our interdependence with others which helps classrooms form compassion and empathy. For example, while students begin to struggle, they withdrawal, but if they are encouraged to collaborate, they discover that their peers may be experiencing the same struggle. Through this discovery, students gain compassion and empathy for others in the same situation creating productive relationships.

This leads to another area that is often excluded or overlooked in interdisciplinary research, the importance of *contingency*. Since publishing his bestselling book on organizational learning, *The Fifth Discipline: The Art and Practice of the Learning Organization*, Senge [23] has embraced a holistic worldview based on *autopoiesis* [24]. In reference to Humberto Maturana, Senge writes, "when we forget our contingent view of reality, we lose our capacity to live together" [24]. Most people associate contingency with having an *alternate plan*, as in a plan "B", but in philosophy the concept relates to Truth, whether Truth is found or made, creating a conflict between the individual and community [7]. For Rorty, community, as the voice of contingent human artifacts should be our guide towards solidarity [7]. For others, such as Van Lier, contingency is the glue for social interaction, classroom discourse, and language pedagogy in which we find meaning from Complexity theory [6]. Finally, contingency is one of the foundations of Buddhist philosophy, rendered in pali as *paticca-samuppada*, commonly translated as *dependent origination*, or *dependent arising*. Using this sense, everything in existence is dependent on something else, rendering the importance of *contingency*.

This awareness can motivate students to engage their friends in English conversation which helps drive language development [25]. Once students gain communicative intentionality at the individual and shared levels, they can begin to seek out more opportunities with others in the community. When this takes place, students become aware that learning is contingent on opportunities that easily arise throughout each day. Moreover, students begin to change their perspective concerning others, and are more apt to become empathetic to the cares of those around them [26].

In self-reflection we realize our need for others, and the joy we gain from others, only to discover that it is not need but reality, or the way things are. Merleau-Ponty, expressed self-awareness as no different than being aware of others [27]. Nonetheless, for a current perspective, I created Praxial Interlanguage Education (PIE), a teaching model that combines insider classroom research, Human Resource Development, Contemplative Education, and Cognitive Science. Furthermore, PIE integrates student learning, development, and the potential for transformation using contemplation at the individual level, compassion at the joint level, and contingency at the collective level.

### III. METHODOLOGY

My research interests and goals, along with my positionality within the classroom helped me determine a methodology that was interdisciplinary, practitioner-based,

and participatory in nature [3]. Moreover, it was crucial for me to integrate my intellectual interests with my working and social context which required that I identify my “knowledge values”, and determine the significance of my research [28]. In practice, I situated myself between disciplines which allowed me to perform my teaching and research while teaching my courses, assuring that my topic and approach merged personally and existentially [28]. Accordingly, my professional practice has been inspired by pragmatics, phenomenology, and ancient wisdom. Therefore, I chose to design a method that would allow me, as insider practitioner, to ethically research my classroom in order to improve my instruction by exploring the experiences and voices of students in my classrooms [8: 6].

While *insider* research has advantages and disadvantages, with important ethical considerations, it essentially allowed me to collect data and construct knowledge from classroom activities without compromising teaching and research. To advance my *praxis*, I collected students’ writings from classroom discussions, and journal writings which would eventually be sensitized along with additional data to be organized, and interpreted through the use of *open*, *axial*, *selective*, and *theoretical* coding [29]. In addition, I used the writings of Husserl, Heidegger, and Gadamer which have influenced the fields of hermeneutics and interpretation [17: 9].

Furthermore, the data was collected from regular classroom activities that asked students to reflect on the academic content from their own particular perspective, and their classmates. Essentially, the data was much more than just students’ opinions, it was a process that included subjective, intersubjective, and objective knowledge which led to student meaning-making. Using the PIE model, research converged on three areas; individual intentionality involving contemplation, joint intentionality involving compassion, and collective intentionality involving contingency.

During the term students were given space to explore concepts centered on the course content. As students engage the academic content on their own, and collaboratively, they become more familiar with the concepts, and are able to understand through the aid of collaboration [5]. *Shared thinking* helps students make sense of their experiences, even if they have limited experiences but can relate to others’ experiences [5].

#### IV.RESULTS

As mentioned above, research into my students’ social dimensions of thinking required a certain type of analysis not used in other types of research. Specifically, I sensitized the data using Open, Axial, Selective, and Theoretical Coding [29]. Using open coding I initially examined the data looking for identifiable concepts. I then used *Axial* coding to make connections between identified concepts. This was followed up by *Selective* coding used in relation to the *theoretical* foundation, which was centered on Tomasello’s, Shared Intentionality and Interdependence Hypotheses [2].

As an *insider* teaching these students, I had a deeper level of understanding that focused on their words and common experiences which were interpreted hermeneutically [17]. Analyzing the data was done throughout the research, as

it unfolded which allowed the research to be fluid and contingent on the students’ experiences. As the term and study progressed, the analysis changed and adapted as the study evolved, and interpretations emerged. Sensitizing students’ experiences produced low-level text-based categories that came from class discussions, and initial readings. Middle-level categories were sensitized and conceptualized as the study and term progressed. Finally, high-level, theoretical constructs began to appear in regard to Tomasello’s Shared Intentionality, and Interdependence Hypotheses, those related to altruistic helping, and mutualistic collaborating [2].

Because of my clearly established worldview that values knowledge constructed from participants’ voices, levels of trustworthiness, dependability, and credibility are maintained [30]. Moreover, a thorough document examination has demonstrated a consistency among the voices that relates to confirmability. Furthermore, my prolonged engagement with the students, and being sufficiently familiar with the context through persistent *emic* observation provided hermeneutic scope. Finally, triangulating interdisciplinary sources and methods, specifically the subjective, intersubjective, and objective demonstrates data, interpretations, and meanings converging on parallel findings.

#### IV. CONCLUSION

Developing and sustaining quality international education requires instruction that is interdisciplinary and integrated with enquiry. Moreover, it requires students to gain transformative insights into their cross-cultural experiences which are contingent of developing cross-cultural communicative intentionality. Nonetheless, “we humans have “limited and fallible cognitive and emotional capacities” that lead to false perceptions and misunderstandings, while having the ability to reconstruct such misunderstandings “to achieve growth of meaning and enriched possibilities for human flourishing” [31]. Subsequently, *flourishing* is not easily attained, especially for students who are using a second language to construct knowledge.

This can be especially true for students at International Colleges who struggle with meaning-making in an interlanguage. In addition, knowledge construction requires self-awareness and student development at a deep level that is typically outside the realm of international higher education. More often, student development is overlooked in International Higher Education in favor of coursework that reflects academic content that has easily measurable outcomes. To overcome this, instructors must allow students the time and space to engage the academic content experientially, using contemplation, compassion, and contingency.

Using PIE for example, students produced a plethora of relevant data that was collected data regular classroom activities that allowed students the time and space to engage academic content through reflection and collaboration. The data indicated that students explored the academic content for the purpose of constructing their own knowledge from reflection, self-awareness, and collaboration. Furthermore, that data demonstrated that many of my students were not at a stage of self-awareness that recognized the importance of development. For example, many believed development was a

natural occurrence while their focus was typically on rote learning. It is because of this that I was compelled to design classroom activities that allowed my students to explore their own thoughts and experiences, and construct their own meanings after collaborating with others.

Therefore, while higher education focuses on academic outcomes, teachers must fill the void by designing classroom activities that open corridors for inquiry that is reflective and collaborative. Such activities can help students develop moral and executive functions that arise from experiential learning [8]. These moral and executive functions help students acquire lifelong learning and social responsibility, traits that can develop throughout their careers. Even though it is problematic to open corridors for inquiry, academic content requires additional effort, especially in interlanguage classrooms where cultural norms are diverse and fluctuate among individuals.

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# Expanding roles of nursing in Taiwan SDGs

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## Abstract

In response to the UN Earth Summit of 1992, Taiwan's Executive Yuan established the National Council for Sustainable Development (NCSD) in August 1997. Taiwan, while attaching equal importance to environmental protection, economic development, and social justice, is committed to building an inclusive, harmonious, prosperous, dynamic, and vibrant society. This will be based on intergenerational equity, social justice, a balance between environment and development, a knowledge economy, protection of human rights, the value of education, respect for indigenous traditions, and international participation. It is dedicated to creating a safe, healthy, comfortable, beautiful, and sustainable living environment, while fulfilling its responsibility as a member of the global village. It will do this while working in coordination with other countries in the pursuit of the UN global sustainable development. Nurses as one of the key health professionals in Taiwan have joined the mission to implement the SDGs in order to reach the 2030 targets. Of the 17 SDGs, SDG3 is directly related to our professional responsibility. There are several achievements we have accomplished in Taiwan and the work will continue for a better tomorrow. The professional growth, of Taiwan, through innovation in the education of knowledge, skills and curriculum designing are of key importance in reaching the target of the SDGs. Among these factors knowledge and competencies, knowledge about new health problems and digital technology along with interprofessional education and interprofessional collaborative practices are essential in the multidisciplinary approach of achieving the SDGs.

**Keyword:** nursing, SDGs, strategies

## I. INTRODUCTION

Four hundred years ago the Portuguese called Taiwan Ilha Formosa because of its beautiful scenery. However, Taiwan is a relatively small island with a high population density, limited natural resources, frequent natural disasters, and a unique international status. As such, the urgency for Taiwan to pursue sustainable development is even greater than for other nations. In addition, over the past several decades, the people of Taiwan have produced tremendous economic growth and established a participatory democracy. Unfortunately, in this process of economic development, Taiwan's natural environment has suffered from pollution and other damage, affecting sustainable development for future generations.

In response to the UN Earth Summit of 1992, Taiwan's Executive Yuan established the National Council for Sustainable Development (NCSD) in August 1997. Taiwan, while attaching equal importance to environmental protection, economic development, and social justice, is committed to building an inclusive, harmonious, prosperous, dynamic, and vibrant society based on intergenerational equity, social justice, a balance between environment and development, a knowledge economy, protection of human rights, the value of education, respect for indigenous traditions, and international participation. It is dedicated to creating a safe, healthy, comfortable, beautiful, and sustainable living environment, while fulfilling its responsibility as a member of the global village and working in coordination with other countries in the pursuit of global sustainable development.

On 25 September 2015, the UN General Assembly adopted the 2030 Agenda for Sustainable Development (UN, 2015). At the core of the 2030 Agenda are 17 Sustainable Development Goals

(SDGs). The aim of the 17 SDGs (see box.1) is to secure a sustainable, peaceful, prosperous and equitable life on earth for everyone now and in the future. They address a range of social needs including education, health, social protection and job opportunities while tackling climate change and environmental protection. The SDGs address key systemic barriers to sustainable development such as inequality, unsustainable consumption patterns, weak institutional capacity and environmental degradation.

Taiwan has thus taken concrete actions in many different areas in line with the UN SDGs. In September 2017, the Executive Yuan of Taiwan published the first version of voluntary national reviews and submitted to the annual UN High-level Political Forum (HLPF), in accordance with the HLPF's guidelines.

Nurses as one of the irreplaceable health professionals have the inherited responsibility to join the mission to implement the SDGs to reach the target in 2030. Of the 17 SDGs, SDG3, SDG4, are directly related to our professional responsibility. We also have a significant influence on SDG6, SDG14, SDG15, and SDG16. There are several achievements we have accomplished in Taiwan and the works are continued for the better of tomorrow. The purpose of this paper is to present the significant achievement of SDGs in Taiwan and the participation of nurses in Taiwan SDGs in the past and the future.

## II. THE SIGNIFICANT ACHIEVEMENTS OF SDGS IN TAIWAN

Adopted from Taiwan VNR<sup>[1]</sup> The Implementation of UN Sustainable Development Goals published in September

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2017, several significant achievements in line with UN SDGs were reported:

*A. Implementation of the Wetland Conservation Act (in line with SDGs 6, 15)*

TABLE I. THE 17 SUSTAINABLE DEVELOPMENT GOALS (SDGS)

1. No Poverty – End poverty in all its forms everywhere
2. Zero Hunger – End hunger, achieve food security and improved nutrition and promote sustainable agriculture
3. Good Health and Well-Being – Ensure healthy lives and promote well-being for all at all ages
4. Quality Education – Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all
5. Gender Equality – Achieve gender equality and empower all women and girls
6. Clean Water and Sanitation – Ensure availability and sustainable management of water and sanitation for all
7. Affordable and Clean Energy – Ensure access to affordable, reliable, sustainable and clean energy for all
8. Decent Work and Economic Growth – Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all
9. Industry, Innovation and Infrastructure – Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation
10. Reduced Inequalities – Reduce inequality within and among countries
11. Sustainable Cities and Communities – Make cities and human settlements inclusive, safe, resilient and sustainable
12. Responsible Consumption and Production – Ensure sustainable consumption and production patterns
13. Climate Action – Take urgent action to combat climate change and its impacts
14. Life below Water – Conserve and sustainably use the oceans, seas and marine resources for sustainable development
15. Life on Land – Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss
16. Peace, Justice and Strong Institutions – Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels
17. Partnerships for the Goals – Strengthen the means of implementation and revitalize the global partnership for sustainable development

Source:

<http://www.un.org/sustainabledevelopment/sustainable-development-goals>

The Wetland Conservation Act, which took effect in February 2015, governs the planning, conservation, restoration, utilization, and management of wetlands. It aims to protect wetlands' natural flood detention function, maintain biodiversity, preserve ecosystems, and ensure that such wetlands are used wisely.

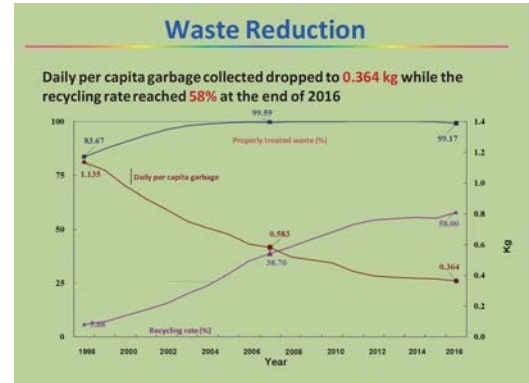


Fig. 1. The achievement in waste reduction and resource recycling. Daily per capita garbage collected dropped to 0.364 kg while the recycling rate reached 58% at the end of 2016

*B. Implementation of the Green Economy Promotion Strategies and Directions (in line with SDGs 8, 9, 11, 12)*

For years, the Taiwan government implemented the policy of waste classification and resources recycling with great achievement. Figure 1 illustrated the amount of daily garbage per capita dropped to 0.364 kg while recycling rate reached 58% at the end of 2016.

The Taiwan National Council for Sustainable Development (NCSD) further approved a set of strategies for promoting the green economy in June 2015 echoing the main theme of the UN Conference on Sustainable Development (Rio+20) held in Rio de Janeiro, Brazil, in June 2012. The overarching strategy is to strengthen five key aspects of the transition to a green economy, i.e., systems, society, nature, human resources, and manufacturing.

*C. Implementation of the Greenhouse Gas Reduction and Management Act (in line with SDG 13)*

The Greenhouse Gas Reduction and Management Act, which was promulgated in July 2015, stipulates long-term greenhouse gas emission reduction targets for Taiwan that by 2050 emissions of greenhouse gases should be reduced to less than 50% of 2005 levels. In addition, in September 2015, Taiwan took the initiative to announce its Intended Nationally Determined Contributions (INDCs). Greenhouse gas emissions totaled 283.5 million tonnes CO<sub>2</sub>e in 2014, slightly lower than the historic peak in 2007 and carbon intensity from fuel combustion dropped from 0.0204 kg CO<sub>2</sub>/NT\$ in 2007 to 0.0160 kg CO<sub>2</sub>/NT\$ in 2015.

In February 2017, the Executive Yuan approved the National Climate Change Action Guidelines to promote

climate change mitigation and adaptation. An interagency action plan has also been activated in an effort to achieve the long-term greenhouse gas reduction targets to ensure Taiwan's sustainable development.

*D. Increase of the Minimum Wage and Five-day Workweek Policy (in line with SDGs 1, 3)*

In September 2016, the Executive Yuan reached a decision to raise Taiwan's minimum wage to improve workers' lives and protect their rights and interests. The minimum hourly wage was raised by 5% effective October 1, 2016, and that the minimum monthly wage was raised by 5.56% to NT\$21,009 (US\$700). In August 2017 that the minimum monthly wage would be increased by another 4.72% to NT\$22,000 (US\$733) effective January 1, 2018, while the minimum hourly wage would also be raised accordingly to NT\$140 (US\$4.67).

In December 2016, the Legislative Yuan passed amendments to the Labor Standards Act, stipulating that workers shall have one mandatory fixed day off and one flexible rest day per week. This measure aims to ensure that workers receive adequate time to rest, while maintaining flexibility.

*E. Amendment to the Gender Equality Policy Guidelines (in line with SDG 5)*

In January 2017, the Executive Yuan approved amendments to the Gender Equality Policy Guidelines, which were first promulgated in December 2011. The guidelines uphold three basic principles: gender equality is a core value in protecting social fairness and justice; improvement of women's rights is the primary task in promoting gender equality, and gender mainstreaming is an effective route to achieve people-oriented policies.

*F. Promotion of an air pollution control strategy (In line with SDGs 3, 13)*

In April 2017 the Executive Yuan announced a new air pollution control strategy, covering 14 measures as well as incentives and restrictions to be implemented simultaneously. The strategy has also set the goals to be achieved by the end of 2019, which include reducing the annual average PM<sub>2.5</sub> concentration by 18.2% of that by the end of 2015, or from 22 µg/m<sup>3</sup> to 18 µg/m<sup>3</sup>. This strategy seeks to protect people's health and ensure that Taiwan fulfill its responsibility as a member of the international community.

*G. Implementation of the Long-term Care Services Act (in line with SDGs 1, 3)*

The Long-term Care Services Act was passed by the Legislative Yuan in May 2015 and took effect in June 2017. Long-term care is defined as the living support, assistance, social participation opportunities, care, and related medical services provided to meet the needs of individuals whose loss of certain mental and physical capacities has lasted for or is expected to last more than six months, or of their caregivers. Long-term care covers such

items as at-home care, community care, institutional residency, and household caregiver support.

*H. Promotion of the Plastic-free Ocean Policy (in line with SDG 14)*

In support of World Oceans Day and this year's theme of "Our Ocean, Our Future," the Environmental Protection Administration has implemented a policy to restrict, reduce, and remove plastics by cutting their usage at the source and preventing plastic garbage from reaching the ocean. In July 2017, the 19 coastal cities and counties in Taiwan jointly held a seabed cleanup activity. In the first six months of 2017, Taiwan removed 192 tons of trash from the sea and seabed. Cleanup activities will continue until the oceans are plastic free.

### III. NURSES ROLE IN SDGS

As the largest portion making up the health professional team, and as one of the irreplaceable health professionals, nurses have the inherited responsibility to join the mission to implement the SDGs to reach the target in 2030. In addition, nurses work in a wide variety of settings and provide a continuum of services, the nursing profession has a wide-reaching impact on implementing SDGs.

Of the 17 SDGs, SDG3 is directly related to our professional responsibility. The SDG3 is "Good Health and Well-Being": Ensure healthy lives and promote well-being for all at all ages. Table II lists the 13 health targets and enablers in SDG3.

From the 13 targets, the United Nations Educational, Scientific and Cultural Organization (UNESCO) organized it into seven topics<sup>[2]</sup>:

- Severe communicable and non-communicable diseases
- Health problems of vulnerable groups and in the most vulnerable regions, and an understanding of how gender inequalities may affect health and well-being
- Direct strategies to promote health and well-being, e.g. vaccines, healthy food, physical activity, mental health, medical consultation, education, sexual and reproductive health education including education about pregnancy avoidance and safer sex
- Indirect strategies (public health) to promote health and well-being: e.g. political programs for health insurances, affordable prices of medicine, health services including sexual and reproductive health care services, drug prevention, transfer of knowledge and technology, reduction of pollution and contamination, early warning and risk reduction.
- Philosophical and ethical conceptions of life quality, well-being and happiness Sexual and reproductive health education including family planning
- Discriminatory attitudes towards people living with HIV, other illnesses or mental disorders Road traffic accidents
- Overweight and obesity, insufficient physical activity and unhealthy food
- Chemicals, pollution and contamination of air, water and soil

TABLE II. THE 13 HEALTH TARGETS IN SDG3S

- 3.1 By 2030, reduce the global maternal mortality ratio to less than 70 per 100 000 live births
- 3.2 By 2030, end preventable deaths of newborns and children under 5 years of age, with all countries aiming to reduce neonatal mortality to at least as low as 12 per 1000 live births and under-5 mortality to at least as low as 25 per 1000 live births
- 3.3 By 2030, end the epidemics of AIDS, tuberculosis, malaria and neglected tropical diseases and combat hepatitis, waterborne diseases and other communicable diseases
- 3.4 By 2030, reduce by one-third premature mortality from noncommunicable diseases through prevention and treatment and promote mental health and well-being
- 3.5 Strengthen the prevention and treatment of substance abuse, including narcotic drug abuse and harmful use of alcohol
- 3.6 By 2020, halve the number of global deaths and injuries from road traffic accidents
- 3.7 By 2030, ensure universal access to sexual and reproductive health-care services, including for family planning, information and education, and the integration of reproductive health into national strategies and programs
- 3.8 Achieve universal health coverage, including financial risk protection, access to quality essential health-care services and access to safe, effective, quality and affordable essential medicines and vaccines for all
- 3.9 By 2030, substantially reduce the number of deaths and illnesses from hazardous chemicals and air, water and soil pollution and contamination

#### Enablers

- 3.a Strengthen the implementation of the World Health Organization Framework Convention on Tobacco Control in all countries, as appropriate
- 3.b Support the research and development of vaccines and medicines for the communicable and non-communicable diseases that primarily affect developing countries, provide access to affordable essential medicines and vaccines, in accordance with the Doha Declaration on the TRIPS Agreement and Public Health, which affirms the right of developing countries to use to the full the provisions in the Agreement on Trade-Related Aspects of Intellectual Property Rights regarding flexibilities to protect public health, and, in particular, provide access to medicines for all
- 3.c Substantially increase health financing and the recruitment, development, training, and retention of the health workforce in developing countries, especially in least-developed countries and small island developing States
- 3.d Strengthen the capacity of all countries, in particular developing countries, for early warning, risk reduction and management of national and global health risks

Nurses have the knowledge of health, hygiene and well-being and also understanding of the importance of gender in health and well-being. Nurses also aware of

the facts and figures about the most severe communicable and non-communicable diseases, and the most vulnerable groups and regions concerning illness, disease and premature death as well as the importance of mental health and how addictions to alcohol, tobacco or other drugs cause harm to health and well-being. In addition to include health-promoting behaviors in their daily routines.

Nurses have to apply relevant prevention strategies to foster positive physical and mental health and well-being, including sexual and reproductive health and information as well as early warning and risk reduction. This effort is only at the individual level but also at institutional, associational, national, and international level.

Nurses also need to understand the socio-political-economic dimensions of health and well-being and knows about the effects of advertising and about strategies to promote health and well-being. As reported by WHO & World Bank (2015)<sup>[3]</sup> that at least 400 million people lacked access to at least one of these services, and that many people were being tipped or pushed further into extreme poverty because they had to pay for health services out of their own pockets. WHO and the World Bank Group (2015)<sup>[3]</sup> also recommend that countries pursuing UHC (SDG3 target 3.8) should aim to achieve a minimum of 80% population coverage of essential health services and that everyone everywhere should be protected from catastrophic and impoverishing health payments. A national health assurance system, as the one implemented in Taiwan government, maybe one of the best solutions to solve the problem of this issue.

#### IV. MAJOR ISSUES AND STRATEGIES TO FULFILL NURSES' ROLE IN SDGS

##### Quantity of nurses

Sustainable Development Goal 3, is essential to the achievement of the other SDGs. UHC means not only reaching everyone in need, but also delivering quality health care services that are people-centered. This requires a well-performing health system with a sufficient number of well-trained motivated health workers. However, it is projected that there will be a shortage of 10.1 million skilled health professionals (nurses, midwives and physicians,) by 2030 (GHWa 2015)<sup>[4]</sup>. The scarcity of qualified health personnel, including nurses, is one of the biggest obstacles to achieving health system effectiveness (Buchan and Aiken 2008)<sup>[5]</sup>. Therefore, more nursing education programs are necessary to provide an adequate amount of nursing workforce to meet needs. Considering that in remote communities and/or in low-middle income countries, as Tomblin-Murphy and Rose (2015)<sup>[6]</sup> reported, the primary care delivered at the local level depended upon the expertise of community health workers or nursing assistants. Before adequate registered nurses are available, community health workers and nursing assistant may be considered as the supplement workforce. A good training program is necessary for them. In Taiwan, a lot of nursing programs in university offer training programs for under-developing and developing countries. We try very hard to participate in the SDGs and take sincerely the responsibility of a member of the global village.



### Quality of nurses

Nurses are educated with a holistic lens so that all facets of a person's health and well-being are considered when planning and delivering care. The important role of nurses in contributing to population health which has been increasingly acknowledged by governments and recognized by the World Health Organization (WHO 2015)<sup>[7]</sup>. But we would all acknowledge that on top of known health problems, we face emerging global threats such as antimicrobial resistance, new pandemics, emerging infections, natural disasters, global climate change, armed conflicts and migrants. In addition, as Tomblin-Murphy and Rose (2015)<sup>[6]</sup> noted, that there is an increasing focus on the determinants of health, the current models of health delivery still tend to focus primarily on the treatment of illness need to be changed. Therefore, constant and continuous further education is needed to keep knowledge updated and competence adequate for coming health care needs.

As to the professional growth, the knowledge is not limited to healthcare-related only. Shamian et al. (2015)<sup>[8]</sup> stressed the importance of interprofessional education (IPE) and interprofessional collaborative practice (IPCP). Nurses are encouraged to advocate for IPE to be included in core curricula and as a part of health worker training programs. In all of the settings in which they work, nurse leaders have an important role in advancing interprofessional collaboration and ensuring that it is supported by appropriate governance, policies, environments and delivery models (Sullivan 2015)<sup>[9]</sup>. A good example of interprofessional collaborative practice is the long-term care. It requires the collaboration of doctors, nurses, physical therapists, social workers, and more.

The WHO also emphasize the necessity to adopt the knowledge of digital technology. As noted by WHO (2010)<sup>[10]</sup> in their six building blocks for a strong health system, there is a need for well-functioning information systems and nurses must be appropriately resourced in relation to this goal. The connectedness of health care systems and the rapid changes in communication technologies has enabled healthcare innovations to be developed and shared more rapidly than ever before. Nurses are using technologies to connect to remote primary care facilities to ensure expert advice is accessible to more people. It is very common that nurses use technologies to monitor vital signs, deliver medications, and measure outcomes. Adopting new technologies will require nurses to be assertive in their requirements for appropriate technological support. Digital technology affects every aspect of the nursing practice environment in every clinical setting. We need to actively participate in the system and promote an understanding that technologies can transform pathways of care and improve patient safety and quality.

The commitment of nurses to SDGs

Nurses play a central role in achieving universal health coverage (UHC) and there are numerous examples of nurses expanding access to essential health services (ICN 2015)<sup>[11]</sup>. To make achievement in SDG3, it requires the commitment of nurses. The examples of areas which require nurses to put effort on include: to ensure a strong nursing voice in all health and social system policy development and planning dialogues, to consider the influence of regulation and legislation on the

health system and HRH planning issues, to design and improve information infrastructures and data collection to support health system redesign and planning and to participate in research related to HRH and in health systems research and evaluation.

### V. CONCLUSION

Nurses are taking an essential role in implementing SDG3. The numbers of nurses with qualified education is not adequate, especially in under-developing and developing countries. All well-developed nursing schools and hospitals should consider offering training programs for these countries. Also, we are encountering new health problems and new technology. Nurses have to keep their knowledge and competence updated and be enthusiastic participants in the implementation of SDGs.

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# **Session of Pure and Applied Science**

# Technology adoption and sustainable livelihood outcomes of farmers producing ethanol feedstocks in Thailand: A qualitative insight

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## Abstract

The Alternative Energy Development Plan 2015 (AEDP2015) has projected the increase in amount of production and consumption of ethanol in Thailand at 11.3 million liter/day in 2036 from 3.52 million liter/day in 2015. To secure availability of ethanol feedstock supply, the main ethanol feedstocks, the country needs to increase the yields of cassava and sugarcane. Technology is seen as a key driver to achieve the target. This paper employed a qualitative approach to investigate technology adoption by cassava and sugarcane farmers and the implications of it on their livelihoods. In-depth interviews and focus group discussions were performed in selected areas where cassava and sugarcane were grown as a major crop. Results indicated that a variety of technologies had been adopted by farmers and that they could be categorized as follows. Those related to mechanization, selection of suitable breeds, practices to improve soil fertility, fertilizer application, pest management and irrigation. Farmers in different areas were seen to adopt different technologies. In addition, they were likely to do the same as their neighbors did. Irrigation technologies were seen to effectively improve yields. Adoption of yield improving technologies was seen to achieve sustainable livelihood outcomes. Increased income, improved well-being and sustainable use of the natural resource base were key outcomes. Irrigation technologies showed huge promise to achieve the AEDP2015's goal, however, affordability and water availability were seen to be limiting factors. The results may be useful for policy makers in addressing assistance programs focusing on small-scale farmers who cannot afford the irrigation technologies.

**Keyword:** ethanol feedstock, technology, adoption, sustainable livelihood

## I. INTRODUCTION

The Alternative Energy Development Plan 2015 (AEDP2015) has projected the increased amount of ethanol produced and consumed in Thailand at 11.3 million liter/day in 2036 from 3.52 million liter/day in 2015 [1]. To achieve this goal, ethanol feedstocks mainly cassava and sugarcane must be sufficiently available. It is expected that the increase in yield of the two plants and yield improving technologies are required to meet the energy demand [2]. These technologies, for example, in the case of cassava include ones associated with soil preparation, production of high stake quality, weeding, good growing and harvesting period, soil fertility improvements and efficient irrigation [3]. At present, there is little information about technology adoption by cassava and sugarcane farmers. This research was aimed at exploring the kinds of technologies adopted by cassava and sugarcane farmers in Thailand, farmers' views on technologies increasing yield, reasons for adoption

or non-adoption and sustainable livelihood outcomes of farmers. Results will be useful for policy makers to propose and implement relevant assistance plans.

## II. MATERIALS AND METHODS

A purposive sampling method was employed in selecting interviewed farmers in provinces, districts, sub-districts and then villages that cassava and sugarcane were substantially grown. The selected provinces included Kamphaeng Phet and Nakhon Sawan (lower-north), Suphan Buri and Kanchanaburi (west) and Nakhon Ratchasima and Chaiyaphum (north-east). In total, 31 key informants representing their villages were recruited for in-depth interviews. They were assigned by the village leaders to provide information and prepared prior to the interviews. Consensus on some issues was determined by counting votes at the monthly village meeting. This was to reduce any bias and ascertain that the answers truly represented the village. In addition, focus group discussions with 7-8 key informants TABLE I. indicates a total number of sampled villages recruited for this study.

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TABLE I. INTERVIEWED KEY INFORMANTS

REGION	PROVINCE	DISTRICT	VILLAGE	INTERVIEW	
				IN-DEPTH	FOCUS GROUP
Lower-north	Kamphaeng Phet	Bung Samakkhi Khanu Woralaksaburi	Ban Pong Sak	Sugarcane	-
			Ban Chang Ngam	Cassava	Cassava
			Ban Huaikaeo Samakkitam	Cassava	Cassava
			Ban Klong Kradan	Cassava	-
		Khlung Khlung	Ban Klong Sombun	Cassava	-
			Ban Ta Kam	Cassava	Cassava
			Ban Noen Plab	Cassava	-
		Muang	Ban Huai Klum	Sugarcane/Cassava	-
			Ban Hin Cha Ngok	Cassava	Cassava
			Ban Hu Kwang	Sugarcane	Sugarcane
North-east	Nakhon Sawan	Pang Sila Thong Banphot Phisai Mae Wong Muang	Ban Pang Kanun	Sugarcane	Sugarcane
			Ban Rai Pattana	Sugarcane	-
			Ban Nong Pai	Sugarcane	Sugarcane
			Ban Santisuk	Sugarcane	Sugarcane
		Phu Khiao	Ban Non Salao	Sugarcane	Sugarcane
			Ban Nong Kon Thai	Sugarcane	-
			Ban Nong Saeng Noi	Sugarcane	Sugarcane
			Ban Lung Pradu	Sugarcane	-
		Huai Thalaeng	Samakki	-	-
			Ban Hua Ang Pattana	Cassava	-
			Ban Wang Muang	Sugarcane	-
			Ban Mai Sam Rong	Cassava	-
		Nong Bun Mak Phi Mai Sikhio Soeng Sang	Ban Sombat Charoen	Cassava	Cassava
			Ban Sombat Pattana	Cassava	Cassava
			Ban Sukpaibun	Cassava	Cassava
			Ban Nong Nae	Sugarcane	Sugarcane
West	Kanchanaburi	Dan Makhom Tia Phanom Thuan	Ban Hin Daen	-	Cassava
			Ban Nong Kae	Sugarcane	-
			Ban Rang Yom	Cassava	Cassava
			Ban Pu Plu	Cassava	-
		Sai Yok Dan Chang Doem Bang Nang Buat Nong Ya Sai	Ban Pu Bong	Sugarcane	Sugarcane
			Ban Bo Kru	Sugarcane	-
			Ban Nong Nae	Sugarcane	Sugarcane
			Ban Nong Nae	Sugarcane	Sugarcane

including experienced farmers, group leaders and village committee members were conducted in some villages at 9 and 8 occasions for cassava and sugarcane respectively. Farmers were asked about their farm practices, adopted technologies, reasons for adoption, views on yield improving technologies and perceived livelihood consequences. In determining sustainable livelihood outcomes, the study applied the Sustainable Livelihood Approach (SLA) framework [4], which has been proved to be a holistic, integrated and people-centered approach [5][6]. In addition, concepts of people-centered approach and five capitals for sustainable development supporting the SLA were also adopted by the National Economics and Social Development Plan, the grand policy of Thailand covering all national issues. A comprehensive concept supporting SLA has been concisely described by Chambers and Conway (1992) as:

“A livelihood comprises the capabilities, assets (including both materials and social resources) and activities required for a means of living. A livelihood is sustainable

when it can cope with and recover from stresses and shocks maintain or enhance its capabilities and assets, while not undermining the natural resource base”.

The paper paid specific attention only to sustainable livelihood outcomes of farmers. A set of indicators provided by DFID such as increased income, improved well-being, enhanced food security, resilience to vulnerability and sustainable use of natural resource base were applied. The key informants were asked to give a single indicator that a majority of villagers considered as the most important outcome. Each in-depth interview and focus group discussion took 45-60 minutes. Audio recording and note taking were performed for the in-depth interviews while only note taking was carried out for the focus groups. Data were analyzed by the content analysis method. In determining livelihood outcomes, each technology was considered its primary role on farmer livelihoods. Expert opinion was sought after in determining the relevance. To validate the results, triangulation was conducted by interviewing key informants of the villages in the vicinity and extension officers of public agencies and companies.

### III. RESULTS AND DISCUSSION

#### A. Technology adoption by cassava and sugarcane farmers

Technologies adopted by cassava farmers were those related to mechanization, soil fertility improvements, use of breeds suitable for growing conditions, drip irrigation, tailor made application of chemical fertilizers and integrated pest management (TABLE II.). Mechanization in cassava farming was restricted to soil preparation only. Practices to improve soil fertility such as the use of green manure, organic fertilizers and materials that act as a soil conditioner were adopted by farmers in all villages across the regions. Farmers who were in areas where water was not available and could not afford artesian wells were likely to adopt only tillage and soil improvement technologies. When asked why did irrigation was not adopt, they always said that there was no water. However, the true reason was that they could not afford the artesian wells (1,000-1,700 USD/well, 1 USD = 30 Baht) and drip equipment (1,000-1,500 USD/ha). It was noted that farmers adopting drip irrigation had higher yield (38-56 t/ha) compared to non-adopters (19-31 t/ha). Diffusion of the drip irrigation technology was dependent on availability of water and investment ability. Soil conservation practices that prevent erosion were rarely adopted. A group of farmers in Ban Khlong Sombun, Kamphaeng Phet Province grew vetiver grass around their cultivation plots to increase topsoil strength and reduce rainfall runoff. Integrated pest management was less popular compared to other adopted technologies. Farmers in Ban Rang Yom, Kanchanaburi used a biological control method together with needed amount of chemical pesticides in pest control. They learned to identify pests and their predators. Green lacewings and parasitic wasps were propagated by a group of farmers in Ban Rang Yom. The insects were used to control mealy bugs, important pests of cassava. In general, mechanization in cassava farming was at low level. Most planting and harvesting activities were manual (Fig. 1.).

Most technologies adopted by sugarcane farmers were those related to irrigation and mechanization (TABLE III.). Machinery was considerably used from soil preparation to harvesting (Fig. 2.). As compared to cassava, sugarcane farming relied on a higher level of mechanization. Practices to improve soil fertility were hardly adopted by farmers across the regions. Normally, during land preparation, farmers put chemical fertilizers into the soil after tilling. However, a group of farmers in Ban Hu Kwang, Nakhon Sawan applied the practice that avoids burning during the harvest. They kept sugarcane leaves covering the land. This helped maintain good conditions of the soil ecosystem in reducing pests and increasing soil organic matter and nutrients. Application of fertilizers after germination was usually done by mechanical means. Fertilizer Deep Placement (FDP) was the practice that applies the fertilizer deep into the soil, and remove weed at the same time. Adoption of irrigation technologies by sugarcane farmers was more widespread compared to cassava farmers. Normally, sugarcane is not tolerant to water scarcity so farmers needed to find water resources. Farmers in irrigated areas or places close to rivers tended to apply furrow irrigation when there was no rain. In areas where the water table was not accessible, investment in artesian wells and irrigation technologies was unavoidable. However, this was not the case in some areas such as Ban Pang Khanun in Kamphaeng Phet and Ban Phu Bong in

Suphanburi where groundwater was unavailable and digging through bedrocks was too difficult. Farmers in these areas relied on rainwater alone. In the north-east region, most sugarcane farms relied on rain and artesian wells. Examples were farmers in villages in Chaiyaphum adopting furrow, fountain and drip irrigation to increase yield of sugarcane. Fountain irrigation requires fountain tapes that look like those used for drip irrigation. Water is splashed out like a fountain when operated. In areas where sufficient water was available, farmers tended to adopt furrow irrigation because of its easiness. Irrigation technologies for sugarcane farming are illustrated in Fig. 3. For those who could not afford artesian wells and had a small piece of land, rain was the primary source of water. The lowest yields at 44-63 t/ha were detected (for instance, in Ban Nong Pai and Ban Santisuk in Kaset Sombun, Chaiyaphum). Application of irrigation technologies was seen to increase yield up to 156 t/ha. In Phu Khiao, Chaiyaphum, irrigation was commonly used 2-3 times for plant crops and once for ratoon crops during the dry season. This would keep moisture in the soil sufficient until the first rain came. There were two energy forms utilized for pumping water mainly electricity and diesel. Farmers whose sugarcane fields were close and able to access to the grid could save more energy cost compared to the use of diesel. Solar-based water pumps were utilized by a couple of sugarcane farmers in Ban Nong Saeng Noi, Phu Khiao, Chaiyaphum. The technology was brand new and its cost was quite high (around 7,000 USD/set). Nevertheless, a farmer in that village saw it was cost effective to invest. In addition, the technology was considered by the public cleaner than diesel and electricity.

#### B. Reasons for adoption

Most farmers tended to adopt technologies that increase yield. Health risks from the use of chemical pesticides were little regarded even by farmers who adopted integrated pest management. This was because weeding by the use of chemicals could be hired. As a primary reason, biological pest control was good for saving costs. It was noted that farmers in a local community tended to follow similar farm practices and adopt the same technologies. They observed neighbors and did the same to increase yield and decrease costs. Water technologies were seen by cassava and sugarcane farmers as the sound technologies to increase yield. Availability of water and money for investment in the technologies were key factors determining the adoption. Cassava farmers who could not afford drip irrigation were likely to give a reason of "no water". When informed that the government provided loans to support access to the technology a majority of them were reluctant to get one. They said that they did not want to have more debt. On the contrary, a majority of sugarcane farmers saw water was very essential. They felt they had no choice and investment in artesian wells and water technologies were necessary. Group leaders also played an important role in technology adoption. In communities where leaders possessed strong leadership skills, adoption of a technology was potentiated. Ban Rang Yom and Ban Khlong Sombun were examples of having good leaders in persuading the use of organic fertilizer plus integrated pest management and

TABLE II. KEY TECHNOLOGIES ADOPTED BY CASSAVA FARMERS\*

VILLAGE	SOIL TYPE	WATER SOURCE	TECHNOLOGY	% ADOPTION	REASON FOR ADOPTION	YIELD (t/ha)
Ban Chang Ngam	Loamy sand	Rain + ponds	<ul style="list-style-type: none"> <li>• Use of poultry litter only</li> <li>• Poultry litter + drip irrigation</li> </ul>	15 85	Increasing yield Increasing yield	19 50
Ban Huaikaeo Samakkitam	Sandy loam	Rain only	<ul style="list-style-type: none"> <li>• Use of poultry litter only</li> <li>• Use of cassava peels + subsoil tilling + use of suitable varieties + tailor made application of fertilizers</li> </ul>	70 30	Increasing yield Increasing yield	19 25-31
Ban Klong Kradan	Sandy loam	Rain only	<ul style="list-style-type: none"> <li>• Use of poultry litter only</li> </ul>	100	Increasing yield	19
Ban Klong Sombun	Sandy loam	Rain + a canal	<ul style="list-style-type: none"> <li>• Use of poultry litter only</li> <li>• Use of poultry litter + drip irrigation</li> <li>• Use of poultry litter + soil erosion prevention<sup>a</sup> + drip irrigation + use of suitable varieties</li> </ul>	50 40 10	Increasing yield Increasing yield Increasing yield/ reducing costs	19-25 38-50 44-50
Ban Ta Kam	Sandy loam	Rain + a canal	<ul style="list-style-type: none"> <li>• Use of poultry litter only</li> <li>• Use of poultry litter + drip irrigation</li> </ul>	70 30	Increasing yield Increasing yield	19 38-44
Ban Noen Plab	Sandy loam	Rain + a canal	<ul style="list-style-type: none"> <li>• Use of poultry litter only</li> <li>• Use of poultry litter + drip irrigation</li> </ul>	70 30	Increasing yield Increasing yield	19 38-44
Ban Hin Cha Ngok	Sandy loam	Rain only	<ul style="list-style-type: none"> <li>• Use of poultry litter only</li> </ul>	100	Increasing yield	19-25
Ban Hua Ang Pattana	Clay loam	Rain + shared artesian wells	<ul style="list-style-type: none"> <li>• Use of poultry litter only</li> <li>• Use of poultry litter + drip irrigation</li> </ul>	80 20	Increasing yield Increasing yield	25-31 50-56
Ban Mai Sam Rong	Sandy loam	Rain only	<ul style="list-style-type: none"> <li>• Use of poultry litter only</li> </ul>	100	Increasing yield	19-25
Ban Sombat Charoen	Clay loam	Rain + ponds	<ul style="list-style-type: none"> <li>• Use of poultry litter only</li> <li>• Use of poultry litter + drip irrigation</li> <li>• Use of cassava peels + drip irrigation + use of suitable varieties</li> </ul>	40 55 5	Increasing yield Increasing yield Increasing yield	19-31 38-50 38-50
Ban Sombat Pattana	Clay loam	Rain + ponds	<ul style="list-style-type: none"> <li>• Use of poultry litter only</li> <li>• Use of poultry litter + drip irrigation</li> </ul>	40 60	Increasing yield Increasing yield	19-31 38-50
Ban Sukpaibun	Clay loam	Rain + artesian wells	<ul style="list-style-type: none"> <li>• Use of poultry litter only</li> <li>• Use of poultry litter + drip irrigation</li> </ul>	30 70	Increasing yield Increasing yield	13-31 38-50
Ban Hin Daen	Sandy loam	Rain + a river	<ul style="list-style-type: none"> <li>• Use of poultry litter only</li> <li>• Use of poultry litter + drip irrigation</li> <li>• Use of poultry litter + drip irrigation + tailor-made application of fertilizers</li> </ul>	70 30 20	Increasing yield Increasing yield Increasing yield/ reducing costs	19-31 38-44 50
Ban Rang Yom	Sandy loam	Rain only	<ul style="list-style-type: none"> <li>• Use of organic fertilizers + natural enemies</li> </ul>	100	Increasing yield/ reducing costs	19-31
Ban Pu Plu	Sandy loam	Rain only	<ul style="list-style-type: none"> <li>• Use of poultry litter only</li> </ul>	100	Increasing yield	19

\* Mechanical soil preparation was practiced by all villages

<sup>a</sup> By growing vetiver grass surrounding cassava plots

TABLE III. KEY TECHNOLOGY ADOPTED BY SUGARCANE FARMERS\*

VILLAGE	SOIL TYPE	WATER SOURCE	TECHNOLOGY	% ADOPTION	REASON FOR ADOPTION	YIELD (t/ha)
Ban Pong Sak	Loam	Rain + artesian wells	Mechanical planting and harvesting + furrow irrigation + FDP	90	Increasing yield	94-125
			Mechanical planting and harvesting + furrow irrigation + FDP + rotational use of varieties	10	Increasing yield	125-156
Ban Huai Klum	Clay loam	Rain only	Mechanical planting + FDP	95	Increasing yield	63
		Rain + artesian wells	Mechanical planting + furrow irrigation + organic fertilizers	5	Increasing yield	
Ban Hu Kwang	Loam	Rain + artesian wells	Mechanical planting + furrow irrigation + FDP	30	Increasing yield	94-125
			Mechanical planting and harvesting + furrow irrigation + FDP sugarcane harvest residues	70	Increasing yield	94-125
Ban Pang Kanun		Rain only	Mechanical planting and harvesting + FDP	60	Increasing yield	50-63
Ban Rai Pattana	Clay loam	Rain + irrigation canals + artesian wells	Mechanical planting + furrow irrigation + FDP	30	Increasing yield	125-156
			Mechanical planting and harvesting + furrow irrigation + FDP + filter cake	70	Increasing yield	125-156
Ban Nong Pai	Sandy loam	Rain only	None	100	-	44-50
Ban Santisuk	Sandy loam	Rain only	None	100	-	44-63
Ban Non Salao	Clay loam	Rain + artesian wells	Mechanical planting and harvesting + furrow irrigation + FDP	100	Increasing yield	94-125
Ban Nong Kon Thai	Loam	Rain + artesian wells	Mechanical planting and harvesting + furrow irrigation + FDP	100	Increasing yield	94-125
Ban Nong Saeng	Loam	Rain + artesian wells	Mechanical planting and harvesting + fountain irrigation + FDP	50	Increasing yield	100-156
			Mechanical planting and harvesting + fountain irrigation + FDP	40	Increasing yield	100-156
			Mechanical planting and harvesting + fountain irrigation + FDP + organic fertilizers	10	Increasing yield	100-156
Ban Lung Pradu Samakki	Silty clay	Rain only	Mechanical planting + FDP	70	Increasing yield	63-94
		Rain + canals	Mechanical planting and harvesting + furrow irrigation + FDP	30	Increasing yield	113-125
Ban Wang Muang	Silty clay	Rain + canals	Furrow irrigation + FDP	80	Increasing yield	94-125
			Mechanical planting + furrow irrigation + FDP	20	Increasing yield	94-125
Ban Nong Kae	Loam	Rain + irrigation canals	Mechanical planting + furrow irrigation + FDP	60	Increasing yield	113-125
			Mechanical planting and harvesting + furrow irrigation + FDP	40	Increasing yield	113-125
Ban Pu Bong	Loam	Rain only	Mechanical planting and harvesting + FDP	100	Increasing yield	63-81
Ban Bo Kru	Loam	Rain + artesian wells	Mechanical planting and harvesting + furrow irrigation + FDP	60	Increasing yield	94-125
			Mechanical planting + furrow irrigation + FDP	40	Increasing yield	94-125
Ban Nong Nae	Loam	Rain + artesian wells	Drip irrigation + organic fertilizers + FDP	50	Increasing yield	63-94
			Furrow irrigation + organic fertilizers	50	Increasing yield	63-94

\*Mechanical soil preparation was practiced by all villages

FDP = fertilizer deep placement (usually combined with mechanized weeding)





Fig. 1. Mechanization level in cassava farming is low. Fig. 1 (A) Most farmers use machinery in land preparation only. Fig. 1 (B) and Fig. 1 (C) Planting and harvesting are primarily by hands. Fig. 1 (D) Drip irrigation is popular in areas where supplement water is available.



Fig. 2. Mechanization level in sugarcane farming is higher than that of cassava. Fig. 2 (A) Machines are used in planting, Fig. 2 (B) fertilizing and weeding and Fig.2 (C) harvesting

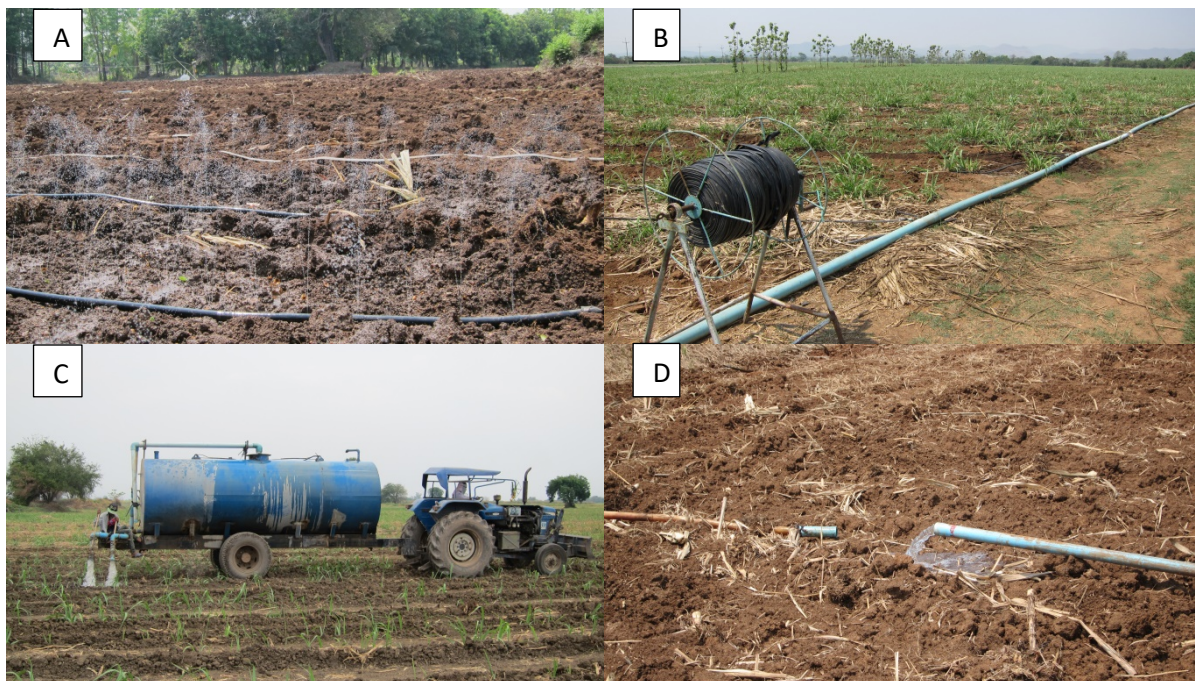


Fig. 3. Irrigation systems applied in sugarcane farming, Fig. 3 (A) fountain, Fig. 3 (B) drip, Fig. 3 (C) furrow using water tank and Fig. 3 (D) furrow using pipes

TABLE IV. A LIST OF YIELD IMPROVING TECHNOLOGIES AND RELEVANT ACHIEVED SUSTAINABLE LIVELIHOOD OUTCOMES

TECHNOLOGY	SUSTAINABLE LIVELIHOOD OUTCOME INDICATORS		
	INCREASED INCOME	SUSTAINABLE USE OF NATURAL RESOURCE BASE	IMPROVED WELL-BEING
• Use of poultry litter (as soil conditioner and fertilizer)	X	X	
• Use of organic fertilizers	X	X	
• Tailor made application of fertilizers	X		
• Fertilizer deep placement, FDP	X		
• Fountain irrigation	X		X
• Drip irrigation	X	X	X
• Furrow irrigation	X		
• Use of suitable varieties/rotational use of varieties	X		
• Subsoil tilling		X	
• Use of natural enemies			X

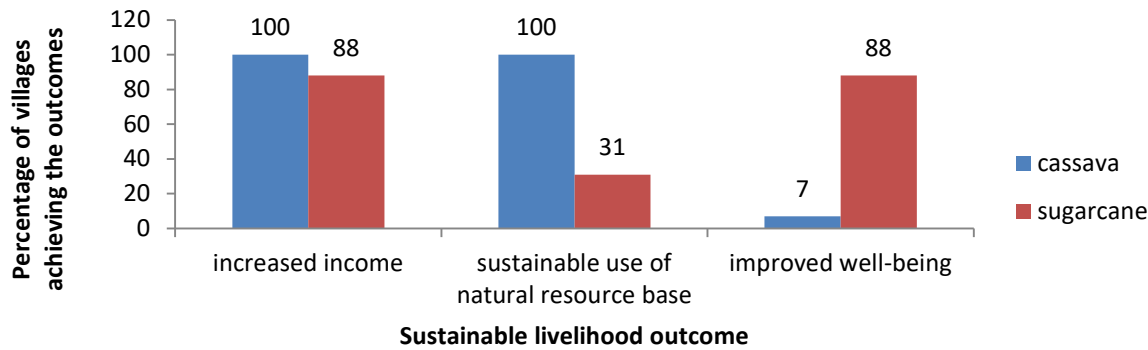


Fig.4. Achieved sustainable livelihood outcomes expressed in % sampled village adopting yield improving technologies

drip technology respectively. In the case of Ban Khlong Sombun, farmers had just adopted drip technology for 2-3 years. It might take time for technology diffusion. Farmers who were financially ready were fast adopters. It was noticed that the technology was diffused to other villages close by that had sufficient water resources such as Ban Ta Kham and Ban Noen Plab. They formed a strong group of drip irrigation users emphasizing on sharing knowledge and experiences.

### C. Sustainable livelihood outcomes of farmers adopting yield improving technologies

Key sustainable livelihood outcomes achieved by adopting the technology were increased income, sustainable use of natural resource base and improved well-being (TABLE IV). Adoption of technologies improving soil fertility such as the use of poultry, organic fertilizers and filter cake resulted in income boosting (from the increase in yield) and sustainable use of natural resource base. Mechanization in

planting and harvesting reduced drudgery and then improved well-being of farmers. Generally, water technologies were observed to increase yield. However, the use of drip technology boosted yield, saved water and reduced field working time so the three outcomes were achieved.

Fig. 4 illustrates percentage of sampled villages that achieved the sustainable livelihood outcomes from adopting technologies. Increased income and sustainable use of natural resource base were the outcomes that all cassava-growing villages achieved. However, sugarcane growing villages achieved the highest percentage of the outcomes of improved well-being and increased income (both at 88%). This reflects the higher level of mechanization used in sugarcane farming compared to the case of cassava. Nevertheless, attention to improve soil fertility resulting in sustainable use of natural resource base in sugarcane farming was lower than that of cassava farming.



#### *D. Implications for Thailand's alternative energy policy*

The AEDP2015 aims to achieve a higher amount of production and consumption of fuel bioethanol in 2036 at 11.3 million liter/day. This requires sufficient amount of bioethanol feedstock which is mainly from cassava and sugarcane (through molasses). Yields of the two crops are expected to increase (44 t/ha and 78 t/ha for cassava and sugarcane respectively) in addition to the increase in cultivation land for sugarcane. Technologies in improving yields are likely to be a key driver to achieve the plan's goal. Based on the results, drip irrigation plus practices improving soil fertility can increase cassava yield up to 56 t/ha. In case of sugarcane, water technologies also improve yield to 94-156 t/ha. It is apparent that the irrigation technologies have a high potential to increase yields. Policy makers should promote adoption of the technologies.

#### **IV. CONCLUSION**

A qualitative approach was employed to study technology adoption by Thai cassava farmers and sugarcane farmers who secured bioethanol feedstock to meet the goal of the country's energy plan. By surveying 31 villages (15 for cassava and 16 for sugarcane) across the country, it is evident that farmers in a local community tend to adopt the same technologies. Technologies in improving soil fertility were adopted by a majority of cassava farmers but a minority of sugarcane farmers. Most sugarcane farmers adopted machinery for planting and harvesting and water technologies. It is obvious that most cassava farmers and sugarcane farmers see irrigation technologies as the key driver in improving yield and upgrading their livelihoods. However, the cost of the technologies may hinder the adoption. Government assistance programs should prioritize the use of water technologies and focus on poor farmers who cannot afford the technologies.

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# Physicochemical properties, total phenolic content and antioxidant activities of aloe vera beverages

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## Abstract

The aim of this study was to investigate the physical and chemical properties, total phenolic content, and antioxidant activities of different proportions of Aloe vera juice (AVJ) that is used to manufacture Aloe vera beverages (AVB). Four AVB samples, called AVB1, AVB2, AVB3, and AVB4, were prepared by using different proportions of AVJ, grape juice concentrate (GJC), and sugar syrup (SS). These were made in ratios of 90:5:5, 90:0:10, 40:5:5, and 40:0:10 (% v/v/v), respectively. The results showed that pH and total soluble solid of the end products ranged from 4.64 to 4.75 and 9.05 to 11.12 oBrix, respectively. The different ratios of AVJ addition led to minimal changes in color. The AVB1 sample showed the highest total phenolic content (1.09 mg GA Eq./100 mL), followed by AVB2 ( $9.85 \pm 0.41$  mg GA Eq./100 mL). AVB1 and AVB2 showed the highest antioxidant activities as measured by metal chelating and the ABTS radical scavenging assay. The results, therefore, conclude that the addition of AVJ at 90% proportion showed significantly better improvements to the total phenolic content and antioxidant potential in AVB than 40% proportion.

**Keyword:** Aloe vera, beverage, total phenolic content, antioxidant activity

## I. INTRODUCTION

Aloe vera (*Aloe barbasensis* Miller) is a perennial plant of Liliaceae family with turgid green leaves joined at the stem in a rosette pattern [1]. The gel of the leaves is associated with many polysaccharides. In fact, more than 200 bioactive chemicals have been found in A. vera gel which provide potentially positive effects on human health beyond basic nutrition [2]. The antioxidant compounds in A. vera may increase the stability and nutritional value of food [3]. Health benefits of A. vera include increasing high-density lipoprotein (HDL), reducing low-density lipoprotein (LDL) and blood sugar in diabetics, fighting acquired immune deficiency syndrome (AIDS), and improving the immune system.

The industries of A. vera products, such as beverage, dairy products, and food supplement, are very important to the economy and have been increasing year by year [4]. Additionally, A. vera has been widely utilized as a resource for functional food, especially healthy drinks contained A. vera gel [1]. Nowadays, Aloe juices with certain blends are very popular, for example lemon juice, sherbet, and electrolytes in sport drink, soluble fiber in a diet drink, vitamin B, amino acid and acetaminophen in a hangover drink, and vegetable juices in healthy drink. However, mucilaginous gel obtained from a fresh A. vera leave has a bitter taste and result in unpleasant taste sensations. The addition of some fruit juices is the easy technique to reduce the bitterness of the vegetable drink. However, the study of appropriate beverage formulation of A. vera gel blended with some fruit juices is

still lacking. Therefore, the aim of this work was to evaluate the effects of the different concentrations of A. vera juice (AVJ) on physical and chemical properties, total phenolic content, and antioxidant capacities in A. vera beverage (AVB).

## II. MATERIALS AND METHODS

### A. Preparation of Aloe vera juice

Fresh green and matured of A. vera leaves with uniform size were obtained from the Aloevera Herb International Co. Ltd., Bangkok. Grape juice concentrate (GJC), and sugar syrup (SS) were purchased from local store. The A. vera leaves were washed and kept in vertical position for about 1 h to facilitate the drainage of yellow liquid sap. The upper and lower rind portion was removed with the knife to separate the inner fillet portion, and further ground by blender and filtrated through the muslin cloth to obtained AVJ gel. Four different formulations of AVB containing different proportions of AVJ:GJC:SS (% v/v/v), namely AVB1 (90:5:5), AVB2 (90:0:10), AVB3 (40:5:5), and AVB4 (40:0:10) were prepared. The beverages were pasteurized at 85°C for 15 min, and then stored in green glass bottles at refrigeration temperature ( $4 \pm 1^\circ\text{C}$ ) before analysis.

### B. Physical and chemical analysis

The total soluble solids (TSS) was tested using a hand refractometer (HR-130, OPTIKA, Italy) and the pH value was

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measured by pH meter (pHMaster LAB, Dynamica Scientific Ltd., UK). Instrumental color measurement was carried out using colorimeter (Chroma Meters CR-400, Konica Minolta, UK) calibrated with black and white standards. The color parameters of lightness ( $L^*$ ), greenness/redness ( $-/+ a^*$ ), blueness/yellowness ( $-/+ b^*$ ), Chroma parameter (C) indicating color intensity, and hue angle ( $H^\circ$ ) were directly recorded for each sample.  $H^\circ$  vary from  $0^\circ$  (pure red color),  $90^\circ$  (pure yellow color),  $180^\circ$  (pure green color), and  $270^\circ$  (pure blue color) [5].

### C. Total phenolic content and antioxidant activities

The total phenolic content was estimated using a modified method of Follin-Ciocalteu method [6]. Briefly, 100  $\mu$ L of AVB was dissolved in 2  $\mu$ L of  $\text{Na}_2\text{CO}_3$  followed by addition of 100  $\mu$ L of Folin-Ciocalteu reagent. After allowing to stand for 30 min at room temperature, the mixture solution was measured the absorbance at 750 nm using UV-Vis spectrophotometer (Genesis 10 UV scanning, Thermo Fisher Scientific, USA). (The total phenolic content was expressed as mg gallic acid equivalent per 100 mL of AVB (mg GA Eq./100 mL sample).

ABTS radical scavenging assay (ABTS assay) was performed according to Wiriaphan *et al.* [7]. ABTS<sup>•+</sup> stock solution was prepared by mixing 7.4 mM of ABTS solution and 2.6 mM of potassium persulfate solution, in 10 mM phosphate buffer pH 7.4, and kept in the dark for 16 h. Fresh ABTS<sup>•+</sup> working solution was prepared by mixing ABTS<sup>•+</sup> stock solution in 10 mM phosphate buffer pH 7.4 (to attain the absorbance at  $0.7 \pm 0.02$ , at 734 nm. Twenty  $\mu$ L of AVB sample was mixed with 1980  $\mu$ L of ABTS<sup>•+</sup> working solution, and then kept in the dark for 5 min before monitoring at 734 nm. Result was expressed as mg Trolox equivalents per 100 mL of AVB samples (mg Trolox Eq./100 mL sample).

Ferric reducing antioxidant power (FRAP assay) was carried out according to Wiriaphan *et al.* [8] with slight modifications. Briefly, FRAP reagent was prepared by mixing 25 mL of 300 mM acetate buffer (pH 3.6), 2.5 mL of 10 mM TPTZ solution in 40 mM HCl, and 2.5 mL of 20 mM  $\text{FeCl}_3 \cdot 6\text{H}_2\text{O}$  solution. 200  $\mu$ L of AVB was mixed with 1 mL of fresh FRAP reagent and then incubated for 1h at room temperature before measuring the absorbance at 593 nm. The result was expressed as mg Trolox equivalent per 100 mL of AVB sample (mg Trolox Eq./100 mL sample).

Metal chelating assay was measured according to Decker and Welch [9] with slight modifications reported by Wiriaphan *et al.* [9]. Briefly, 100  $\mu$ L of AVB was mixed with 50  $\mu$ L of 2 mM  $\text{FeCl}_2$  and 100  $\mu$ L of 5mM 3-(2-pyridyl)-5,6-bis (4-phenyl-sulfonic acid)-1,2,4-triazine (ferrozine). The mixture was incubated at room temperature in the dark for 20 min. The color of ferrous iron-ferrozine complex was monitored at 562 nm. Result was expressed as mg EDTA equivalents per 100 mL of AVB sample (mg EDTA Eq./100 mL sample).

### D. Statistical analysis

The experiments were performed with arrangements in a completely randomized design (CRD) (and the mean value  $\pm$  standard deviations were presented. Data analyses were

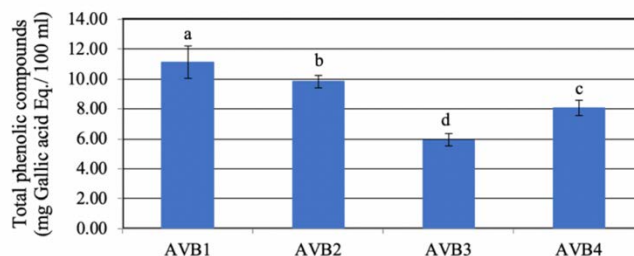
performed by ANOVA (analysis of variance (and computed by the SPSS statistics for Windows, Version 17.0) SPSS Inc., Chicago, U.S.A. (Duncan's new multiple range test) DMRT ( was used to determine significant differences among results and statistical significance was accepted at the 95 % probability  $p \leq 0.05$  level).

## III. RESULTS AND DISCUSSION

### A. Physicochemical characteristic of Aloe vera beverage

The results obtained with respect to physical and chemical characteristics are presented in Table 1. Four blends of AVB with different proportions of AVJ, GJC, and SS caused little change of pH varied from 4.64 to 4.75. The TSS of AVB varied between 9.35 to 11.10 °Brix which was insignificantly affected by AVJ concentrations ( $p > 0.05$ ).

For color characteristics were observed that  $L^*$  of 90% AVJ addition samples (AVB1 and AVB2, by 53.42 and 56.50, respectively) showed higher than 40% AVJ addition (AVB3 and AVB4, by 59.51 and 59.80, respectively), whereas  $b^*$  was observed with the higher value in AVB1 and AVB2, indicated that AVB with 90% AVJ addition exhibited more dark-yellow. While  $a^*$  showed negative value in all samples, indicating a slight green color. Comparable result was previously reported by Di Scala *et al.* [10], the initial colorimetric parameter  $L^*$ ,  $a^*$ , and  $b^*$  of fresh A. vera gel were 52.00, -3.75, and 18.72, respectively. With regard to C and  $H^\circ$  value, there were no significant differences in C and  $H^\circ$  value of all samples. The samples presented the C and  $H^\circ$  values ranging from 10.73 to 13.12 and 92.28 to 95.52, respectively, indicated that they had bright yellow color. In general, high  $H^\circ$  value together with low C value is often indicative of a dull color [11].



Bars with differences letters indicate means with significant different ( $p \leq 0.05$ ).

AVB1: 90% of Aloe vera juice, 5% of grape juice concentrate, and 5% of sugar syrup.

AVB2: 90% of Aloe vera juice and 10% of sugar syrup.

AVB3: 40% of Aloe vera juice, 5% of grape juice concentrate, and 5% of sugar syrup.

AVB4: 40% of Aloe vera juice and 10% of sugar syrup.

Fig. 1. Total phenolic content of each A. vera beverages (AVB).

### B. Total phenolic content and antioxidant activities

Phenolics are considered as the main component of the plant, which can suppress free radicals [12]. The total phenolic content are shown in Fig. 1. It was found that AVB1 had the highest total phenolic content with the value  $11.16 \pm 1.09$  mg GA Eq./100 mL, followed by AVB2 and AVB4, respectively, ( $9.85 \pm 0.41$  and  $8.07 \pm 0.52$  mg GA Eq./100 mL, respectively). Comparable results were previously reported by Hulle *et al.* [13], who reported that the phenolic content for untreated and thermal treated of A. vera beverage mixed with

TABLE I. Physicochemical characteristic of each Aloe vera beverages (AVB).

Parameters	Values **			
	AVB1	AVB2	AVB3	AVB4
Biochemical attributes				
pH	4.68 ± 0.05 <sup>a,b</sup>	4.64 ± 0.06 <sup>a</sup>	4.75 ± 0.02 <sup>b</sup>	4.67 ± 0.08 <sup>a</sup>
TSS (°Brix) <sup>ns</sup>	11.10 ± 0.85	10.12 ± 0.34	9.05 ± 3.05	10.35 ± 1.12
Color				
L*	53.42 ± 3.68 <sup>b</sup>	56.50 ± 1.80 <sup>a,b</sup>	59.51 ± 3.22 <sup>a</sup>	59.80 ± 4.70 <sup>a</sup>
a*	-1.10 ± 0.67 <sup>b</sup>	-0.60 ± 0.28 <sup>a,b</sup>	-0.72 ± 0.36 <sup>a,b</sup>	-0.48 ± 0.39 <sup>a</sup>
b*	11.92 ± 2.39 <sup>a,b</sup>	14.45 ± 1.82 <sup>a</sup>	10.69 ± 3.03 <sup>b</sup>	11.64 ± 0.92 <sup>b</sup>
Chroma (C) <sup>ns</sup>		13.12 ± 0.90	10.73 ± 3.00	11.65 ± 0.90
Hue (H°) <sup>ns</sup>	11.99 ± 2.34	92.28 ± 1.71	94.54 ± 3.24	92.50 ± 2.05
	95.52 ± 4.00			

\*\* : Values are expressed as mean ± S.D. (n = 6).

<sup>a-b</sup>: Superscript letters with different letters in the same column indicate significant difference ( $p \leq 0.05$ ).

ns: non-significant.

AVB1: 90% of Aloe vera juice, 5% of grape juice concentrate, and 5% of sugar syrup.

AVB2: 90% of Aloe vera juice and 10% of sugar syrup.

AVB3: 40% of Aloe vera juice, 5% of grape juice concentrate, and 5% of sugar syrup.

AVB4: 40% of Aloe vera juice and 10% of sugar syrup.

TABLE II. Antioxidant activity of A. vera beverages (AVB).

Sample	ABTS radical scavenging	FRAP value	Metal chelating activity
	activity	(mg Trolox	(mg EDTA Eq./100 mL)
	(mg Trolox Eq./100 mL)	Eq./100 mL) <sup>ns</sup>	
AVB1	3.08 ± 0.71 <sup>a</sup>	1.44 ± 0.18	5.61 ± 0.49 <sup>a</sup>
AVB2	3.34 ± 0.68 <sup>a</sup>	1.60 ± 0.42	4.75 ± 0.69 <sup>a</sup>
AVB3	1.41 ± 0.23 <sup>b</sup>	1.33 ± 0.27	2.27 ± 0.91 <sup>b</sup>
AVB4	3.23 ± 0.75 <sup>a</sup>	1.56 ± 0.05	2.26 ± 0.78 <sup>b</sup>

Values are expressed as mean ± S.D. (n = 6).

<sup>a-b</sup>: Superscript letters with different letters in same row indicate significant difference ( $p \leq 0.05$ ).

ns: non-significant.

AVB1: 90% of Aloe vera juice, 5% of grape juice concentrate, and 5% of sugar syrup.

AVB2: 90% of Aloe vera juice and 10% of sugar syrup.

AVB3: 40% of Aloe vera juice, 5% of grape juice concentrate, and 5% of sugar syrup.

AVB4: 40% of Aloe vera juice and 10% of sugar syrup.

litchi fruit was 33.6 and 42 mg GA Eq./100 mL, respectively. Whereas, total phenolic content of pure A. vera gel contained 37.70 mg GA E/q.100 mL, [10]. However, total phenolic content in AVB samples were lower than the previous studies, this might be due to the different of concentrations, thermal treatments and kinds of fruit juice blending as well as growth conditions of plant.

The antioxidant activities of plant extracts have been broadly used as the important parameter in order to evaluate their bioavailability as medicinal foodstuffs [12]. In this study, antioxidant activities were determined in accordance with three methods, including ABTS assay, FRAP assay, and metal chelating assay. The scavenging activity for the ABTS radical varied from 1.41 to 3.34 mg Trolox Eq./100 mL (Table 2). The samples of AVB1 and AVB2 showed the highest for

ABTS assay (3.08 ± 0.71 and 3.34 ± 0.68 mg Trolox Eq./100 mL, respectively), which showed the similar trend to metal chelating assay (5.61 ± 0.49 and 4.75 ± 0.69 mg EDTA Eq./100 mL, respectively). Although, antioxidant activity evaluated by FRAP assay was not significantly ( $p > 0.05$ ) different between each sample. These results indicated that high concentration of AVJ addition impacted on greater antioxidant activities. The sample with high concentration of AVJ had greater amount of phenolic compound that highly correlated with antioxidant activity. The ability of phenolic compound involves antioxidant activity with different mechanism, including scavenge free radicals, donate hydrogen atoms or electron, or chelate metal cations [14]. Heş *et al.* [15] confirmed the metal chelating ability of aloe extract. Moreover, Nejatzadeh-Barandoz [16] noticed the ability of A. vera gel extract on ferric ion reducing powder. In generally,

phenolic compounds can play an important role on reducing power activity which is based on chelation of  $\text{Fe}^{2+}$  ions in a quantitative manner by the reagent ferrozine, resulting in the formation of a complex with  $\text{Fe}^{2+}$  ions. Therefore, the chelating ability influences other scavenging activities of free radicals which protect the organisms against oxidative damage [17, 18]. Nevertheless, the concentrations of phenolic compounds are not the only factor influencing antioxidant capacity, but their structural arrangements (number and position of hydroxyl groups, double bonds, and aromatic rings) also play the key role [19].

## V. CONCLUSION

Based on the results, the concentration of AVJ leads to minimal changes in physical and chemical properties, including pH, TSS, and color of the AVB. The AVB samples with 90% proportion of AVJ addition promoted a significant increase in antioxidant activities by metal chelating agent assay and ABTS assay, and total phenolic content, but did not affect to FRAP assay value. Consequently, it can be concluded that the AVB samples with 90% AVJ addition was the suitable condition of healthy beverage. However, further clinical trials regarding these claims are necessary before accurate conclusions regarding these health benefits can be made

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# Attenuation coefficients of problock and red brick for gamma ray shielding applications

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## Abstract

In this work, the physical and the  $\gamma$ -rays shielding properties of problock and red brick were investigate and compared with theoretical calculation.  $^{137}\text{Cs}$  and  $^{60}\text{Co}$  sources have been used for experimental measurements of the mass attenuation coefficient of  $\gamma$ -rays at 662, 1172 and 1332 keV and theoretically calculated using WinXcom program. The results show that the densities of problock and red brick were 2.191 and 2.321 g/cm<sup>3</sup>, respectively. For  $\gamma$ -rays shielding properties, the mass attenuation coefficients were decreased with increasing  $\gamma$ -rays energy. Our result showed relative difference between theory and experiment of less than 3 %, indicating the potential of the samples as wall radiation shielding.

**Keyword:** mass attenuation coefficient,  $\gamma$ -rays, wall, brick

## I. INTRODUCTION

Nowadays, radioactive sources are used widely in tomography, medicine  $\gamma$ -rays fluorescence studies, radiation biophysics, nuclear power plants, agriculture, industry and research. Use of these sources brings serious shielding problems as X-rays and  $\gamma$ -rays are hazardous to human health [1]. Wall bricks are important for use in the construction of medical hospitals and nuclear power plants as well as other buildings which contain sources of radiation. Homogeneous and high density bricks are essential for effective radiation protection; these wall brick are a good choice in building constructions which are required to protect the environment from hazardous radiations [2]. Wall bricks have three types. These are lightweight concrete, red brick and brick block or concrete block. Problock is an innovative brick made from fly ash, which is recycled material form combustion of solid fuels. It is blended with autoclave technology. Problocks have high quality and save energy more than red bricks. They take less than 4-6 hours to produce compared to a red brick that takes 3 days. Problocks have a load capacity compressive strength of 7.12 MPa, a thermal conductivity 0.34 W/m.K, an SCT rating of 43 SCT and have a fire resistant rating of 4 hours. In addition to this they have other advantages such as being easy for cutting and drilling [3].

In this work the physical properties of problocks and red bricks have been studied and the  $\gamma$ -ray shielding properties have been compared with theoretical calculation. The  $^{137}\text{Cs}$  and  $^{60}\text{Co}$  sources have been used for experimental measurements of the mass attenuation coefficient of  $\gamma$ -rays at 662, 1173 and 1332 keV. The theoretical results have been calculated using WinXcom program for applied wall radiation shielding materials.

## II. EXPERIMENT

### Material preparation

In this work we took brick sample from houses. The problocks and red bricks that were studied are shown in Fig.1-2. All samples were analyzed using X-ray fluorescence Spectrometry (XRF). The composition of all samples is show in Table no 1. The results found that the main compound in problock is CaO and that the main compound in the redbrick was SiO<sub>2</sub>.



Fig. 1. Problock



Fig. 2. Redbrick



### Density

By applying the Archimedes principle, the weights of the prepared samples were measured in air and in water using a 4-digit sensitive microbalance (AND, HR200). Then the density ( $\rho$ ) was determined from the following relationship [4]

$$\rho = \frac{w_a}{w_a - w_w} \times \rho_w \quad (g / cm^3)$$

(1) where  $w_a$  is the weight of the sample in air,  $w_b$  is the weight of the sample in water and  $\rho_w$  is the density of water.

### Theoretical and experimental gamma-rays

The mass attenuation coefficient is written as

$$\mu_m = \ln \left( \frac{I_0}{I} \right) \quad (cm^2 / g) \quad (3)$$

where  $\rho$  is the density of material ( $g/cm^3$ ),  $I_0$  and  $I$  are the incident and transmitted intensities, respectively, and  $t$  is the thickness of the absorber in cm.

Theoretical values for the mass attenuation coefficients of the mixture or compound were calculated using WinXCom, based on the mixture rule [5].

$$\mu_m = \sum_i w_i (\mu_m)_i \quad (cm^2 / g) \quad (4)$$

where  $w_i$  weight fraction of each element in mixture,  $(\mu_m)_i$  is mass attenuation coefficient for individual element in mixture. The diagram of experimental setup for mass attenuation coefficient determination is shown in Fig. 3. The source and absorber system were mounted on adjustable stands. This setup can move in the transverse direction for accurate beam alignment.  $^{137}\text{Cs}$  and  $^{60}\text{Co}$  radioactive sources were used with a strength of 15 mCi (555 MBq). These were obtained from the Office of Atom for Peace (OAP), Thailand. The incident and transmitted gamma-rays intensities were measured for a fixed preset time in each experiment by recording the corresponding counts. This was measured using the 2 in  $\times$  2 in NaI(Tl) detector having an energy resolution of 8% at 662 keV (BICRON model 2M2/2), with CANBERRA photo- multiplier tube base model 802-5. The dead time in this experiment was 0.73–1.37%. The pulse shaping time was 0.5  $\mu\text{s}$ . An optimum sample thickness ( $0.5 \leq \mu x \leq 5.0$ ) was selected in this experiment on the basis of the Nordfors criteria. The statistical error in this experiment was calculated from the standard error of 3 items. These were (i) ray-sum measurement, which was calculated from the experiment. The ray-sum is the product of the linear attenuation coefficient ( $\mu$ ) with thickness ( $x$ ); (ii) density measurement and (iii) thickness measurement. Finally, the total standard error was determined by combining errors for the ray-sum measurement, density measurement and thickness measurement in a quadrature. The

spectra were recorded using a CANBERRA PC-based multi-channel analyzer. In this experiment, the validity of the mass attenuation measurement was confirmed by measuring a lead slab [6].

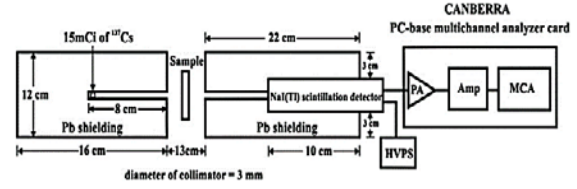


Fig. 3. Experimental setup for mass attenuation coefficient determination.



Fig. 4. X-ray fluorescence Spectrometry (XRF).

Table I. Composition of problock and red brick

Composition (%)	Problock	Red brick
Al <sub>2</sub> O <sub>3</sub>	6.874	14.042
SiO <sub>2</sub>	21.581	47.783
K <sub>2</sub> O	1.765	7.173
CaO	45.276	1.933
TiO <sub>2</sub>	2.402	2.673
MnO	0.134	0.277
Fe <sub>2</sub> O <sub>3</sub>	18.364	26.042
SO <sub>3</sub>	3.604	-
ZnO	-	0.077

Table II. Physical properties of sample

Sample	Density (g/cm <sup>3</sup> )
Problock	2.191
Red brick	2.321

## III. RESULTS AND DISCUSSION

### Physical properties

The density results are shown in Table no 2. The results shows that the densities of problock and red brick were 2.191 and 2.321 g/cm<sup>3</sup>, respectively.

### Gamma-ray shielding properties

The mass attenuation coefficients of the samples were evaluated from gamma-rays incidence ( $I_0$ ) and transmitted ( $I$ ) intensities and its theoretical values were calculated by winXCom program at 662, 1,172 and 1,332 keV. It has been found that the mass attenuation coefficient values decreased with increasing gamma ray energy in both samples as shown in Fig. 5. This indicates the better shielding properties of the problock. The experimental values of mass attenuation coefficient are in good agreement with the theoretical values with a %RD less than 3 %. In this case, the mass attenuation coefficient of the problock was greater than red brick. This shows that there is more photon attenuation in problock than red brick. It was therefore concluded that rowlocks have shielding properties that are better than red brick and that there is more photon attenuation in problock than red brick.

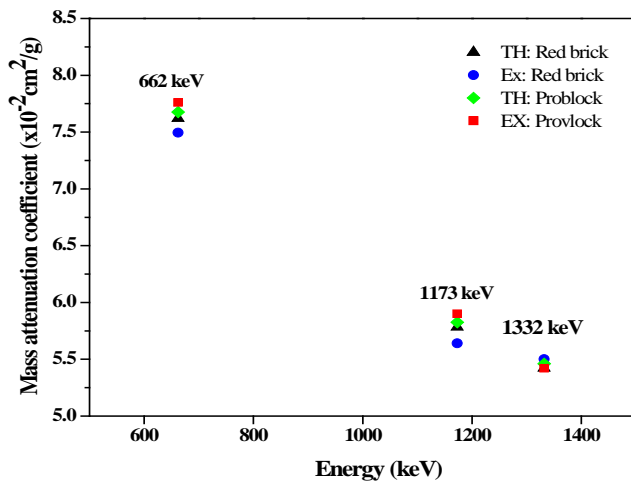


Fig. 5. The mass attenuation coefficients of samples in energies range 662 -1332 keV.

#### IV. CONCLUSION

In this work, problock and red brick have been investigated for their, physical and radiation shielding properties. The results found that the density problock and red brick were 2.191 and 2.321 g/cm<sup>3</sup>, respectively. It has been found that the mass attenuation coefficient values decreased with increasing gamma ray energy in both samples. The experimental values of mass attenuation coefficient are in good agreement with the theoretical values with a %RD of less than 3 %. The mass attenuation coefficients of problock was greater than red brick, indicating that problock has good potential as a material for building a radiation shielding wall.

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# Radiation shielding properties for clay bricks and autoclaved aerated concrete bricks

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## Abstract

This research studied the radiation interaction of gamma rays with clay and autoclaved aerated concrete bricks. The clay and autoclaved aerated concrete bricks were determined by using gamma rays spectrometer with Compton scattering arrangement for energy variation and analyzed the composition by X-ray Fluorescence Spectroscopy (XRF). The results were determined mass attenuation coefficient values from theory by WinXCom program and experiment respectively. The  $Z_{\text{eff}}$  and the  $N_{\text{el}}$  value were studied for radiation shielding properties of the clay and autoclaved aerated concrete bricks. This research was found that the clay brick had good radiation properties than autoclaved aerated concrete. The experimental values are in good agreement with theoretical values.

**Keyword:** autoclaved aerated concrete, clay brick, mass attenuation coefficient

## I. INTRODUCTION

Humans have studied and researched in many ways. To make advances in science and technology Science and technology have a role in human's daily life in both industrial aspect agricultural aspect medical aspect including how to use the ray to preserving food by using solar powered oven ,Nuclear power plant by using radioactive substances ,X-raying ,Radiation destroys cancer cells , MRI or CT Scan and so on[1]. As mentioned Radiation is very useful to humans ,However we have to know and understand the correct way to using because radiation also dangerous to a creature, for example, the explosion of nuclear reactor of Chernobyl nuclear power plant in Ukraine on date 26 April 1986 and Earthquake in Japan on date 11 March 2011 which makes reactor lack of coolant the increasing of heat is making melt and radiation leakage ,but radiation is a particular that unable to be known by the human senses, so it unable to know that you already got radiation into your body or not for the safety a person who concern about radioactive need to find the solution to protect damage from radioactive for reduce risk from receiving radioactive by unreasonable based on the principle from International Radiation Protection Organization ALARA (As Low As Reasonably Achievable) by spend the least time to work Use the longest distance and use radiation shielding for protect the body to gain the excessive radiation standard[2]. Nowadays for prevent X-ray and gamma rays materials used for radiation shielding include lead, concrete, steel[3]. From the principle as said so study Interaction between gamma rays and clay bricks and autoclaved aerated concrete. Which used for housing to study radiation shielding properties [4].

The mass attenuation coefficients, effective atomic number and electron density are basic quantity required for determining the attenuation of X-rays and gamma-rays in matter and useful for understanding their physical properties.

Several authors reported mass attenuation coefficients and effective atomic number of some gemstones as following: L.

Gerward et. al.[5-6] introduced the WinXCom program for calculating the mass attenuation coefficients of elements, compounds and mixtures materials.

In the present there is a high amount of usage gamma rays. It needs to prevent the danger of gamma rays, coupled with the utilization. The residency or house in the present are made from clay bricks or and autoclaved aerated concrete, hence house is a very important factor for prevent radiation that cannot be avoided such as Living near industrial plants or a place where the source of radiation[7]. The radiation shielding properties of clay bricks and autoclaved aerated concrete have been investigated and compared in this research.

## II. EXPERIMENT

### A. Measurement of physical properties of samples

The samples, while the measurement of physical properties was measured density of samples following the relation:

$$\rho = \frac{W_a}{W_a - W_b} \rho_b \quad (1)$$

where  $\rho$  is density of sample,  $W_a$  is the weight of sample in air,  $W_b$  is the weight of sample in water and  $\rho_b$  is the density of water.

The analysis of element composition to identify the weight percent in the samples were measured with X-ray fluorescence spectrometer (XRF), Minipal-4, Panalytical. XRF is helpful and accurate analytical instrument widely used for determining element composition in unknown materials.

### B. Gamma-ray shielding studies procedure

The shielding properties of samples were calculated with two processes, first: theoretical calculation were calculate with WinXCom program, second: experimental calculation were measured by transmission method and using the Compton scattering for vary the gamma ray energy from 0.228 MeV to 0.622 MeV.

In this part, the data from XRF, weight percent of element composition of each samples were input in WinXCom. The mass attenuation coefficient ( $\mu_m$ ) in unit ( $\text{cm}^2/\text{g}$ ) were calculated with energy range from 223 - 662 keV, based on the rule of mixture:

$$\mu_m = \sum_i w_i (\mu_m)_i \quad (2)$$

where  $w_i$  is the weight fraction of element  $i$  in samples and  $(\mu_m)_i$  is mass attenuation coefficient for individual element  $i$  in samples. The value of mass attenuation coefficient  $\mu_m$  depends on density of the samples, can be used to determine the total atomic cross-section ( $\sigma_{t,a}$ ) following relation:

$$\sigma_{t,a} = \frac{(\mu_m)_{\text{soils}}}{N_A \sum_i^n (w_i / A_i)} \quad (3)$$

where  $N_A$  is Avogadro's number and  $A_i$  is the atomic weight of each element  $i$  of the samples. Furthermore, the total cross-section ( $\sigma_{t,el}$ ) is following relation:

$$\sigma_{t,el} = \frac{1}{N_A} \sum_i^n \frac{f_i A_i}{Z_i} (\mu_m)_i = \frac{\sigma_{t,a}}{Z_{\text{eff}}} \quad (4)$$

where  $f_i$  is the number of atoms of element  $i$  relative to the number of atom of all elements in samples,  $Z_i$  is the atomic number of element  $i$  in element composition in samples and  $Z_{\text{eff}}$  is effective atomic number of samples explain with following relation:

$$Z_{\text{eff}} = \frac{\sigma_{t,a}}{\sigma_{t,el}} \quad (5)$$

The electron density ( $N_e$ ) can be defined as the number of electrons per unit mass, and it can be mathematically written as follows [4-9]:

$$N_e = \frac{\mu_m}{\sigma_{t,el}} \quad (6)$$

## III. RESULTS AND DISCUSSION

1.The component element of samples by XRF are result show in TABLE I and TABLE II

TABLE I. CLAY BRICKS'S COMPONENT ELEMENTS

Compound	Weight (%)
Si	48.387
K	13.275
Ca	4.985
Ti	3.058
Mn	0.476
Fe	28.988
Zn	0.095
Rb	0.297
Sr	0.055
Zr	0.255
Pb	0.128

TABLE II.

TABLE II. AUTOCLAVED AERATED CONCRETE BRICK'S COMPONENT ELEMENTS

Compound	Weight (%)
Si	13.776
K	1.073
Ca	78.162
Ti	0.547
Mn	0.098
Fe	6.013
Cu	0.025
Zn	0.039
Rb	0.031
Sr	0.139
Zr	0.098

2.The density of samples by Archimedes is principle with 4-position scales from AND company model HR-200 are show in TABLE III.

TABLE III. THE AVERAGE DENSITY OF SAMPLES

Sample (brick)	Density ( $\text{g}/\text{cm}^3$ )
AAC	$2.5241 \pm 0.0352$
Clay	$2.5239 \pm 0.0401$

3.The mass attenuation coefficient of clay brick and autoclaved aerated concrete bricks for theoretical and experimental values are show in TABLE IV and TABLE V, respectively.

TABLE IV. MASS ATTENUATION COEFFICIENT, OF CLAY BRICK

Energy (Mev)	Theoretical value, $\mu_m$ (cm <sup>2</sup> /g)	Experimental value, $\mu_m$ (cm <sup>2</sup> /g)
0.228	0.122	0.121
0.249	0.117	0.117
0.290	0.110	0.109
0.341	0.102	0.102
0.415	0.094	0.094
0.488	0.088	0.087
0.573	0.082	0.081
0.662	0.077	0.076

TABLE V. MASS ATTENUATION COEFFICIENT OF AUTOCLAVED AERATED CONCRETE

Energy (Mev)	Theoretical value, $\mu_m$ (cm <sup>2</sup> /g)	Experimental value, $\mu_m$ (cm <sup>2</sup> /g)
0.228	0.127	0.127
0.249	0.122	0.119
0.290	0.113	0.112
0.341	0.105	0.104
0.415	0.096	0.096
0.488	0.089	0.089
0.573	0.083	0.082
0.662	0.076	0.077

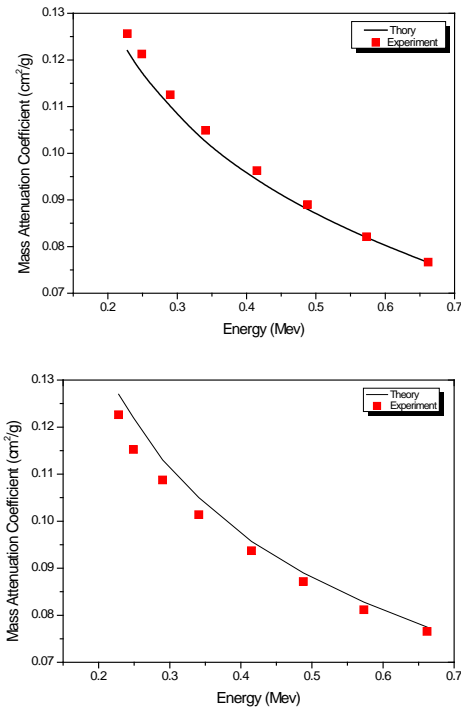


Fig.1. Mass attenuation coefficient and energy of clay brick (up) and autoclaved aerated concrete (down)

The mass attenuation coefficient and energy of clay brick and autoclaved aerated concrete were decrease with increasing gamma-rays energy due to the interaction probability were decrease at higher energy in this energy range as shown in Fig. 1. The two samples are in the same trend. The clay brick has

more mass attenuation coefficient at all of the same gamma-rays energy.

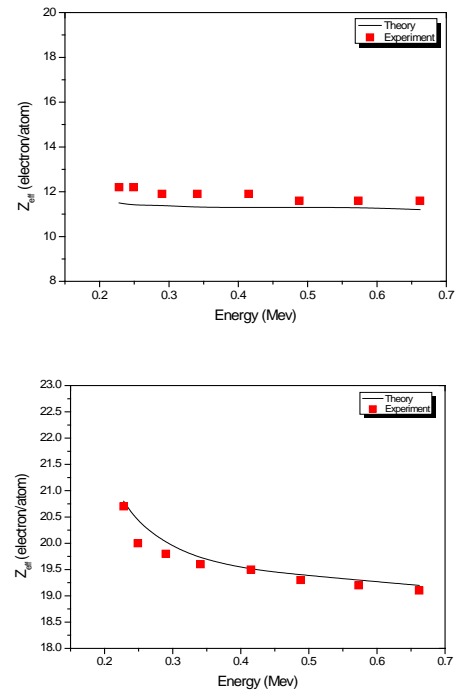
4.The effective atomic number of clay and autoclaved aerated concrete bricks for theoretical and experimental values are show in TABLE VI and TABLE VII, respectively.

TABLE VI. EFFECTIVE ATOMIC NUMBER,  $Z_{\text{EFF}}$  VALUE OF THE CLAY BRICKS.

Energy (Mev)	Theoretical value, $Z_{\text{eff}}$ (electron/atom)	Experimental value, $Z_{\text{eff}}$ (electron/atom)
0.228	11.9	12.1
0.249	11.9	12.1
0.290	11.9	12.0
0.341	11.8	12.0
0.415	11.6	11.9
0.488	11.3	11.8
0.573	11.3	11.8
0.662	11.2	11.8

TABLE VII. EFFECTIVE ATOMIC NUMBER,  $Z_{\text{EFF}}$  VALUE OF THE BRICKS OF AUTOCLAVED AERATED CONCRETE.

Energy Mev	Theoretical value, $Z_{\text{eff}}$ (electron/atom)	Experimental value, $Z_{\text{eff}}$ (electron/atom)
0.228	20.8	20.7
0.249	20.4	20.0
0.290	20.0	19.8
0.341	19.7	19.6
0.415	19.5	19.5
0.488	19.4	19.3
0.573	19.2	19.2
0.662	19.1	19.1

Fig. 2. Effective atomic number,  $Z_{\text{eff}}$  value and energy of the clay bricks(up) and autoclaved aerated concrete(down).

The effective atomic number of clay brick has small decrease with increasing gamma-rays energy and autoclaved aerated

concrete was clearly decrease with increasing gamma-rays energy in this energy range as shown in Fig. 2. The autoclaved aerated concrete has more effective atomic number at all of the same gamma-rays energy.

5.The electron density of clay and autoclaved aerated concrete bricks for theoretical and experimental values are show in TABLE VIII and TABLE IX, respectively.

TABLE VIII. ELECTRON DENSITY,  $N_{EL}$  VALUE OF CLAY BRICKS.

Energy (Mev)	Theoretical value, $N_{el}$ ( $\times 10^{23}$ electron/gram)	Experimental value, $N_{el}$ ( $\times 10^{23}$ electron/gram)
0.228	3.04	3.02
0.249	3.03	3.02
0.290	3.01	2.99
0.341	3.00	2.98
0.415	2.99	2.99
0.488	2.98	2.97
0.573	2.98	2.96
0.662	2.98	2.96

TABLE IX. ELECTRON DENSITY,  $N_{EL}$  VALUE OF AUTOCLAVED AERATED CONCRETE.

Energy (Mev)	Theoretical value, $N_{el}$ ( $\times 10^{23}$ electron/gram)	Experimental value, $N_{el}$ ( $\times 10^{23}$ electron/gram)
0.228	3.24	3.23
0.249	3.19	3.13
0.290	3.13	3.09
0.341	3.08	3.06
0.415	3.04	3.04
0.488	3.03	3.01
0.573	3.02	3.01
0.662	3.01	3.00

The electron density of clay brick has small decrease with increasing gamma-rays energy and autoclaved aerated concrete was clearly decreased with increasing gamma-rays energy in this energy range as shown in Fig. 3. The autoclaved aerated concrete has more electron density at all of the same gamma-rays energy.

The results of effective atomic number and electron density show the same trend with the mass attenuation coefficients result. These shielding parameters show the ability of radiation shielding were decrease with increasing of gamma ray energy due to the interaction probability were decrease at higher energy. Moreover the autoclaved aerated concrete shows the radiation shielding properties higher than clay bricks.

#### IV. CONCLUSION

Property of clay brick and autoclaved aerated concrete from component analysis in both samples of bricks by using spectrometer x-rays energy distribution type. The result of chemical component in samples found high amount of Si, Ca and Fe which are the main components of both bricks, but clay brick has Pb(0.128%) which not found in aerated brick and

aerated brick contain Cu(0.025%) which this not available in clay brick.

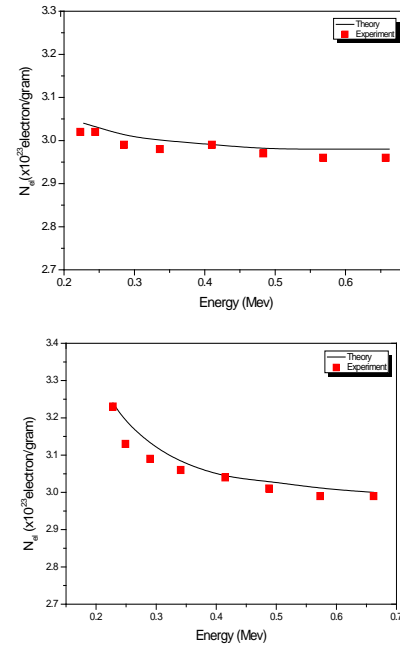


Fig.3. Electron density,  $N_{el}$  value and energy of clay bricks(up) and autoclaved aerated concrete.(down).

Density of clay brick and autoclaved aerated concrete from measurement by using the Archimedes' s principle with 4-position scales. The results show the autoclaved aerated concrete have the density more than clay brick with a little.

All of shielding parameters show the ability of radiation shielding were decrease with increasing of gamma ray energy due to the interaction probability were decrease at higher energy and shows that the autoclaved aerated concrete has a better shielding property than clay brick.

#### ACKNOWLEDGMENT

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# Visible luminescence of $\text{Sm}^{3+}$ ions in Lithium Strontium Borate glasses

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## Abstract

$\text{Sm}^{3+}$ -doped lithium strontium borate glasses (LSrBSm, with compositions  $50\text{Li}_2\text{O}: 20\text{SrO}: (30-x)\text{B}_2\text{O}_3: x\text{Sm}_2\text{O}_3$ , where  $x = 0.0, 0.1, 0.3, 0.5$  and  $1.0$  mol%) were prepared using the conventional melt quenching technique. Their optical properties were characterized using various spectroscopic techniques at room temperature. These were absorption, excitation and emission spectra. The experimental data revealed that the nine discrete absorption bands peaking at 403, 474, 944, 1081, 1230, 1370, 1481, 1531 and 1593 nm were due to the transitions from  $^6\text{H}_{5/2}$  ground state level to various excited states of  $\text{Sm}^{3+}$  ions. The emission spectra of  $\text{Sm}^{3+}$  ions in these glasses have been measured using a 403 nm xenon lamp as an excitation source. The characteristic emission and the radiated parameters obtained for the  $^4\text{G}_{5/2} \rightarrow ^6\text{H}_{7/2}$  transition show that the LSrBSm glass could be useful for the development of lasers and photonic device applications in the visible region.

**Keyword:** samarium, borate, glasses, luminescence

## I. INTRODUCTION

In recent years, rare earth doped glasses are found to be more useful materials for optical devices such as up-convertors, light emitting diodes (LEDs), fiber amplifiers, memory devices, fluorescent display devices, etc.,. The demand for developing efficient luminescent materials including suitable hosts for lanthanide ions remains highly desirable [1–3]. Among the rare earth elements (RE), the  $\text{Sm}^{3+}$  ( $^4\text{f}_5$ ) ion is one of the most interesting ions to characterize the spectroscopic and radiates properties because of its use in high-density optical storage, under sea communication, color displays and its emitting  $^4\text{G}_{5/2}$  level exhibits high quantum efficiency and also shows different quenching emission channels. The main reason for not carrying on many spectral studies of  $\text{Sm}^{3+}$  ions doped in glasses is the complicated structure of  $^4\text{f}_6$  configuration of this ion [1-17]. There are some oxide glasses, such as borate, silicate, germinate and phosphate. Borate-based glasses, which contain a dominant content of  $\text{B}_2\text{O}_3$  as a glass former, have many advantages, such as low cost, high stability and easy preparation and exhibit high solubility of RE ions. Therefore, they have attracted much attentions in various field of applications. In this study, the lithium strontium borate glass doped with samarium ion ( $\text{Sm}^{3+}$ ) were prepared by the normal melt quenching technique and investigated their physical, optical and luminescence properties for photonic material applications.

## II. EXPERIMENTAL

A series of LSrBSm glass samples were synthesized with compositions  $50\text{Li}_2\text{O}: 20\text{SrO}: (30-x) \text{B}_2\text{O}_3: x\text{Sm}_2\text{O}_3$  (where  $x$  are  $\text{Sm}_2\text{O}_3$  content ranging from 0.0, 0.1, 0.3, 0.5 and 1.0 mol%). The chemical mixtures were melted in an alumina crucible by normal melts quenching technique at  $1,000^\circ\text{C}$  for about 3 hours in an electric furnace. The melting was air

quenched by pouring it into a graphite mold and annealed at  $450^\circ\text{C}$  for 5 hours to remove thermal strain. Then, take the

glass samples to study the various properties. The glass densities were measured by the Archimedes method analysis with a densitometer (AND, HR-200) with pure water as immersion liquid:

$$\rho = \frac{w_{\text{air}}}{w_{\text{air}} - w_{\text{water}}} \times \rho_{\text{water}} \quad (1)$$

Where  $w_{\text{air}}$  and  $w_{\text{water}}$  represent the weight of the glass in air and water respectively, and  $\rho_{\text{water}}$  is the density of the water ( $\sim 0.9982 \text{ g/cm}^3$ ).

To ensure the accuracy, each measurement was repeated three times per sample. The optical absorption spectra of the glass sample in the range of 350 – 2,300 nm were recorded at room temperature with the Shimadzu UV-3600 spectrophotometer. The emission and excitation spectra measurements were carried out using the Cary Eclipse fluorescence spectrophotometer with 403 nm excitation wavelength. The color of any light source exact by three variables  $x(\lambda)$ ,  $y(\lambda)$ ,  $z(\lambda)$ , which are dimensionless quantities, were defined by The Commission International de L'Eclairage (CIE) standard [18]. The chromaticity color coordinates are calculated by the following equations:

$$\begin{aligned} x &= \frac{X}{X + Y + Z} \\ y &= \frac{Y}{X + Y + Z} \end{aligned} \quad (1)$$

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$$z = \frac{Z}{X + Y + Z}$$

Where X, Y and Z are the tristimulus values, which is related to the three basic colors red, green and blue colors needed to match the color wavelength  $P(\lambda)$ .

### III. RESULT AND DISCUSSIONS

#### A. Density, Molar volume and Refractive index

The densities of all glasses doped with  $\text{Sm}^{3+}$  ions have been observed to be slightly increased proportional to the  $\text{Sm}_2\text{O}_3$  content, which may be due to atomic weight of  $\text{Sm}_2\text{O}_3$  (348.72 g/mol) heavier than that of  $\text{B}_2\text{O}_3$  (69.62 g/mol). For the obtained values of molar volume, depend on both molecular weight and density. The changes may be attributed to the change of interatomic spacing inside the glasses network; hence the glass system becomes looser when more  $\text{Sm}^{3+}$  ions are added in to the glass network. The molar volume increases with the increasing concentration of  $\text{Sm}_2\text{O}_3$  which indicates an increase of glass network rigidity. The increase in glass density is due to an increase in the number of non-bridging oxygen (NBO) in the glass [19]. Moreover, the increase in molar volume results in an increase in the bond length or the interatomic spacing. The relations between density and molar volume for glass samples as function of  $\text{Sm}_2\text{O}_3$  concentration are shown in Fig. 1. and Fig. 2, respectively. In Fig. 3, the refractive indexes of the LSrSm glasses were plotted as a function of  $\text{Sm}_2\text{O}_3$  concentration. In this series of glasses, the refractive index becomes higher with increasing  $\text{Sm}^{3+}$  content because of the greater polarizability of NBO's.

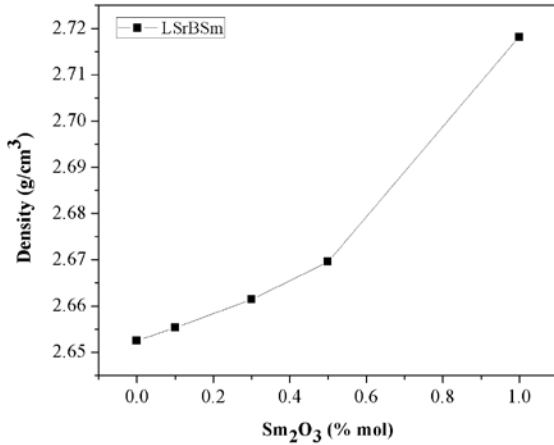


Fig. 1. The variation of the density against with  $\text{Sm}^{3+}$  concentration.

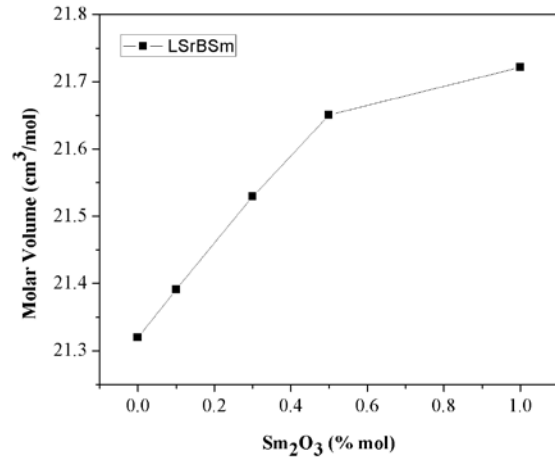


Fig. 2. The variation of the molar volume against with  $\text{Sm}^{3+}$  concentration.

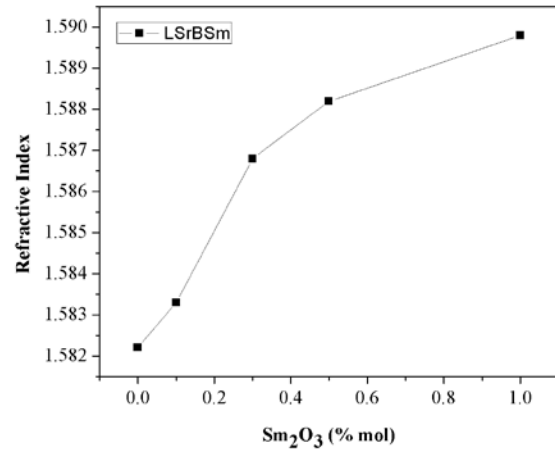


Fig. 3. Refractive index of LSrB :  $\text{Sm}^{3+}$  glass.

#### B. Absorption spectra

The optical absorption spectra of the LSrSm glasses measured in UV-visible-NIR regions are shown in Fig. 4. The assignments of the bands are also shown in this figure. In total, nine excited states have been identified and are assigned. All transitions in the absorption spectra of  $\text{Sm}^{3+}$  started from the  $^6\text{H}_{5/2}$  ground state to the various excited states. As can be seen from Fig. 4, the  $^6\text{H}_{5/2} \rightarrow ^6\text{P}_{3/2}$  transition is found to be relatively more intense than the other transitions.

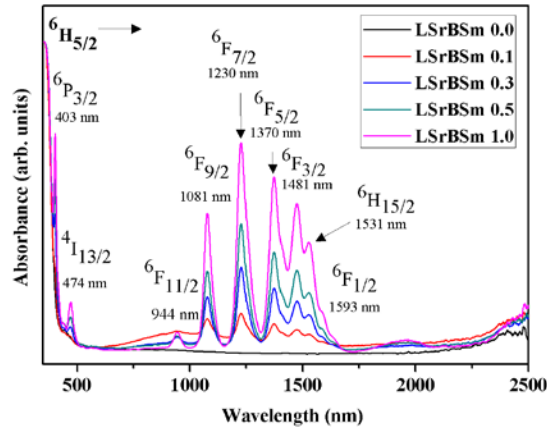


Fig. 4. Absorption spectra of  $\text{Sm}^{3+}$  in lithium strontium borate glasses.

### C. Fluorescence spectra

The emission spectra of  $\text{Sm}^{3+}$ -doped LSRBSm glasses in 500–800 nm spectra range under the 403 nm excitation are shown in Fig. 5. The spectra were normalized to unity for the  ${}^4\text{G}_{5/2} \rightarrow {}^6\text{H}_{7/2}$  transition. The emission spectra consisted of potential emission which correspond to  ${}^4\text{G}_{5/2} \rightarrow {}^6\text{H}_{5/2}$  (563 nm),  ${}^4\text{G}_{5/2} \rightarrow {}^6\text{H}_{7/2}$  (600 nm),  ${}^4\text{G}_{5/2} \rightarrow {}^6\text{H}_{9/2}$  (646 nm) and  ${}^4\text{G}_{5/2} \rightarrow {}^6\text{H}_{11/2}$  (706 nm) transitions, respectively. These are desirable in high density optical storage, under sea communications, colour displays and medical diagnostics [15].

Fig. 6 showed the excitation spectra for the LSRBSm glasses recorded from 325–550 nm at an emission wavelength 600 nm, which corresponds to the  ${}^4\text{G}_{5/2} \rightarrow {}^6\text{H}_{7/2}$  transition (as seen in Fig. 5). The excitation spectra showed characteristic features of  $\text{Sm}^{3+}$  excitation without any spectral shifts in all samples under 600 nm emissions, corresponding to  ${}^4\text{H}_{9/2} \rightarrow {}^4\text{H}_{5/2}$  (345 nm),  ${}^4\text{D}_{3/2} \rightarrow {}^4\text{D}_{5/2}$  (362 nm),  ${}^6\text{P}_{7/2} \rightarrow {}^6\text{P}_{5/2}$  (375 nm),  ${}^4\text{L}_{13/2} \rightarrow {}^4\text{L}_{11/2}$  (403 nm),  ${}^6\text{P}_{5/2} \rightarrow {}^6\text{P}_{3/2}$  (405 nm),  ${}^4\text{M}_{17/2} \rightarrow {}^4\text{M}_{15/2}$  (439 nm),  ${}^4\text{I}_{13/2} \rightarrow {}^4\text{I}_{11/2}$  (461 nm),  ${}^4\text{M}_{15/2} \rightarrow {}^4\text{M}_{13/2}$  (472 nm),  ${}^4\text{I}_{11/2} \rightarrow {}^4\text{I}_{9/2}$  (488 nm),  ${}^4\text{F}_{3/2} \rightarrow {}^4\text{F}_{5/2}$  (526 nm) transitions of  $\text{Sm}^{3+}$  ion, respectively [13].

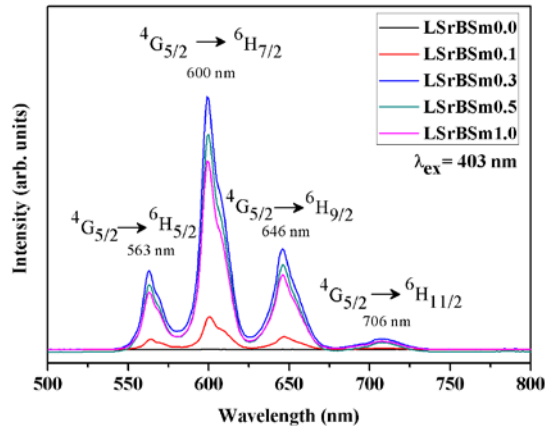


Fig. 5. Emission spectra of LSRBSm glasses with different  $\text{Sm}_2\text{O}_3$  content.

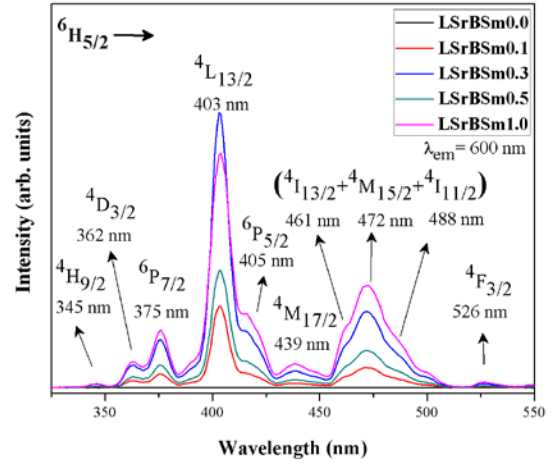


Fig. 6. Typical excitation spectra of the LSRBSm glass samples.

### D. Radioluminescence spectra

Fig. 7 represents the RL spectra of the  $\text{Sm}^{3+}$ -doped LSRBSm glasses, excited by 50 kV, 30 mA of X-ray beam. The observed 4 emission bands centered at 563, 600, 646 and 706 nm are assigned to  ${}^4\text{G}_{5/2} \rightarrow {}^6\text{H}_J$  ( $J = 5/2, 7/2, 9/2$  and  $11/2$ ) transitions, which corresponded to the emission spectra (Fig. 5).

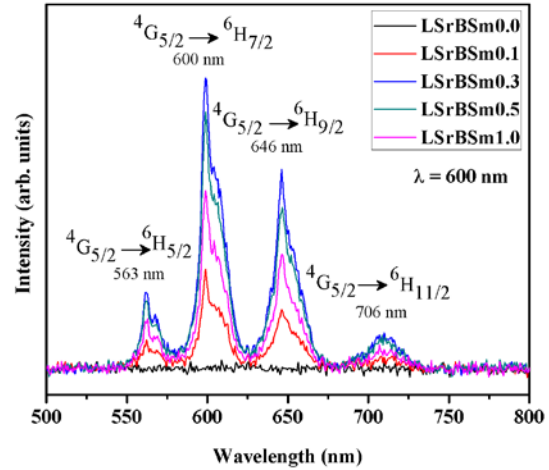


Fig. 7. Radioluminescence spectra of the LSRBSm glasses excited by 50 kV, 30 mA of X-ray irradiation.



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# **Session of Electrical Engineering and Computer Technology**

# The development of database system for alumni via web application

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## Abstract

Web applications are a source of assessments which people all around the world can access to manage and share information. The technology provides information for organizational management such as human resources, marketing, financial and accounting. For educational terms, academic collect a huge of student data, management and instruction. Then management and efficiency of data storage are important. In this paper, web application for managing database of alumni is proposed. Web application equips methodology of alumni data manage through website, and search alumni details equip keyword for searching alumni, including student's name, student's code, graduated year and faculty that consists of branches. User of this system are general user, member, alumni and administrator. For alumni, requisition function is defined at first time to checking alumni details by administrator. Result of checking alumni status is sent to user via email address. Designing database for gathering alumni details is applied Data Warehouse principle in terms of data transformation and design main table as fact table, and creating relational table as keyword search. In testing phase, unit test and user acceptance are used to evaluate performance and efficiency of web application. User has accepted application at good design, good performance of search function, and moderated service when this application is a prototype. However, this software provides beneficial things for university to manage alumni data and supports internal quality assurance. For leader of department or others can create views of several dimensions to making decision about educational management that is next step for the application.

**Keyword:** database system, alumni, web application

## I. INTRODUCTION

Web application is defined as the main source of knowledge that provides a diverse range of services [1], for example, online banking, online learning, and online storage, and web application have become an important part of the daily life. For the educational terms, web application has developed to support services and manage educational system such as registration, finance, human resource and library [2]. However, various services via web application established a huge number of data of storing data into storage. Numerous data transfers to generate beneficial information for academic term difficulty. Data management is the feasible guideline for academy.

For academic term, various data is stored in database system that is concerned management based on technology. Transferring various data and filtering data are difficult process for management. University is educational organization that has collected various data in database system. Especially data related student is more collection in database system than others. The Office of the Higher Education Commission has announced internal quality assurance guideline for university. The evaluation criteria have been separated into six types that involve teacher, student, instructional management and also graduate [3]. For evaluating university based on the guideline, data related this process is gathered from many sources such as paper, report and database system. Moreover, system development concerns performance technology to support various operation. Therefore, efficiency and effectiveness of system will be

developed. Web application can equip widely searching requirement of system.

In this research, web application for alumni database system is represented. The main point of this research is developed web application to support storing alumni data in database and provides searching solution by using data and solution of Valaya Alongkorn Rajabhat University under the Royal Patronage. Alumni database system provides four types of user that are general user, member, alumni and administrator that can manage data through back end system. This paper is structured in the following introduction. In section 2 studying related work is discussion. In section 3, research methodology is described. Research result and conclusion and future work are presented in section 4 and 5.

## II. RESEARCH METHODOLOGY

This research applied Software Development Life Cycle [4] to develop web application. The process shows in figure 1.

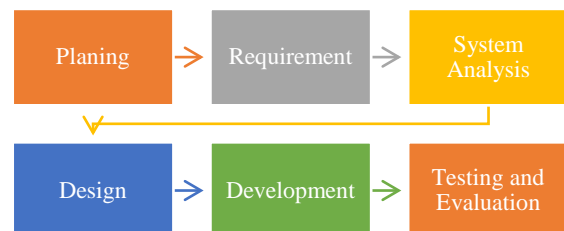


Fig. 1. Research methodology.

### A. Planning

The researchers brief the concept of project by defined timeline, project phase, alumni data transformation from university database to database of web application, and target group user and stakeholder who involve alumni database. The user for gathering requirement is the Head of leader, Chief of Student Development Office and Administrator of registration database system. However, primary technologies are defined as OOP concept to develop website based on collaborating a part of data through folder [5], PHP language for developing core website, Bootstrap 4.0 framework to responsive design of website interface [6] and then Data Warehouse concept for storing data [7]. For primary study, core web application function is searching and managing preliminary alumni details.

### B. Requirement

This phase is gathering requirement from defined user by using brainstorming to get related data. User would like to present domains of using alumni data for supporting quality assurance system, and developing the database center for alumni. Nevertheless, Amount of alumni data in database will arrange to Business Intelligence (BI) [8] to making decision and train. User have defined process and user of this web application shown in figure 2.

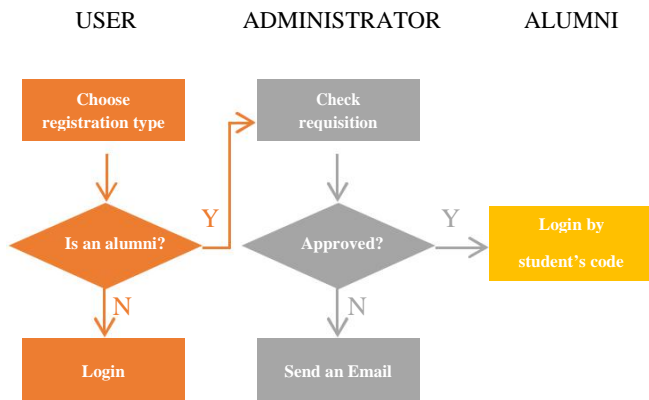


Fig. 2. Register process.

The figure 2 is shown process of registration that user requested to regarding to alumni details. Checking requisition of user that request under alumni status is sent to administrator of this system to confirm tangible user by checking alumni details in database of registration department. Both approved requisition and rejected requisition are forwarded to an email report consider result. For approved requirement, status of user will be changed to alumni. When user has been approved as alumni, he or she has to login by using student's code for permission.

### C. System Analysis

To provide solution by concerning user requirements, researchers analyzed requirement, process of registration, brief user group and main function of web application in usecase diagram [9] shown in figure 3.

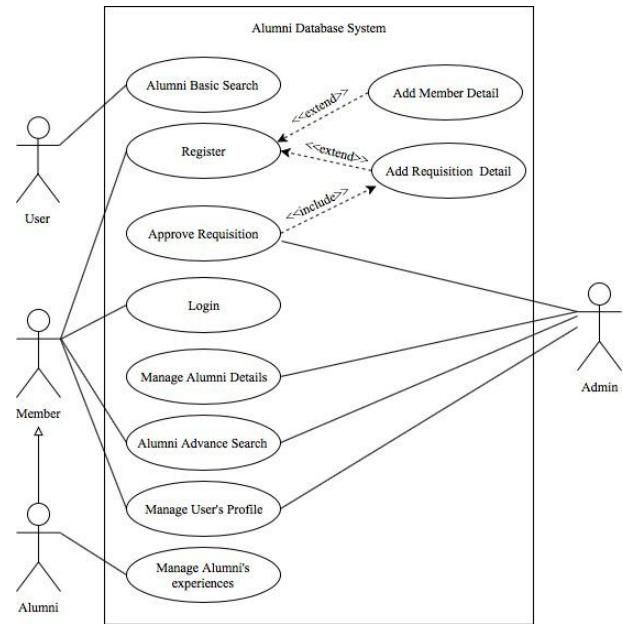


Fig. 3. Usecase diagram of the system.

Web application primary functions are defined as under user requirements. Search function has been become the main function of this application that provides user for using benefit of data in database. For figure 3, usecase diagram illustrates four level of user that are comprise general user, member, alumni who send demands for checking a part of data definitions contained web form, and administrator who is responsibility manage student detail. The table below depicts usecase diagram descriptions.

TABLE I. USECASE DIAGRAM DESCRIPTIONS

No.	USECASE	DESCRIPTIONS
1	ALUMNI BASIC SEARCH	RESULTS OF TYPE OF SEARCH LIMIT FOUR ATTRIBUTES CONSIST OF SRUDENT'S CODE, NAME, FACULTY, AND GRADUATED DATE.
2	REGISTER	REGISTER'S CRITERIA INCLUDES MEMBER AND ALUMNI
3	APPROVE REQUISITION	ADMINISTRATOR CAN CHECK DETAILS OF REQUISITION AFTER DECISION RESULTS ARE SENT TO USER'S EMAIL.
4	LOGIN	USER CAN LOGIN TO WEB APPLICATION FOR GETTING MORE FUNCTIONS.
5	MANAGE ALUMNI DETAILS	MANAGING ALUMNI'S DETAILS INCLUDE ADDING, EDITING AND DELETING.
6	ALUMNI ADVANCE SEARCH	THE ADVANCE SEARCH FUNCTION SUPPORTS MEMBER, ALUMNI AND ADMINISTRATOR. RESULT OF SEARCH INCLUDES STUDENT'S CODE, NAME, FACULTY, GRADUATED DATE, ADDRESS AND EMAIL.
7	MANAGE USER'S PROFILE	MANAGER CAN ADD AND EDIT THE PROFILE.
8	MANAGE ALUMNI'S EXPERIENCE	AND ALUMNI CAN ADD AND DELETE WORK EXPERIENCES.



#### D. Design

For design phase, we constructed physical prototype for web application, including user interface, keyword search and database [10]. The interface of web application separates to four parts by user level consists of general user, member, alumni and administrator. Interface style is defined by using Bootstrap framework that emphasizes green and white color. In terms of keyword search, researchers separated keyword to four parts that presents in figure 4.

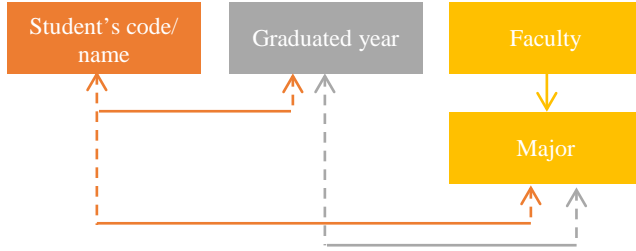


Fig. 4. Search alumni method.

Search function provides alternative choice for user that consists of searching by student's code, graduated year, and faculty. User can select one more keyword to retrieve the result such as 123456 (student's code), and 2017 (graduated year). The search algorithm is created by binary search methodology to increase performance of searching [11].

To increasing speed search, database for collecting alumni details is defined by applying ETL process of Data Warehouse to filter and extract original structural data that is gathered in excel file format, illustrated in figure 5.

Fig. 5. The original database.

Table and relationship design under normalization concept. Anyhow, speed and effectiveness of searching are entailed when some attributes are defined as table. Although, level of table is limited less than three levels as Data Warehouse concept [6]. Database schema represents in figure 6.

Database relations include Alumni as fact table or main table, Login that provides details for member and alumni, Experience consisting of work details of alumni, Faculty, including branches that have requisitions for user, and Academic Year that defines year of alumni graduated.

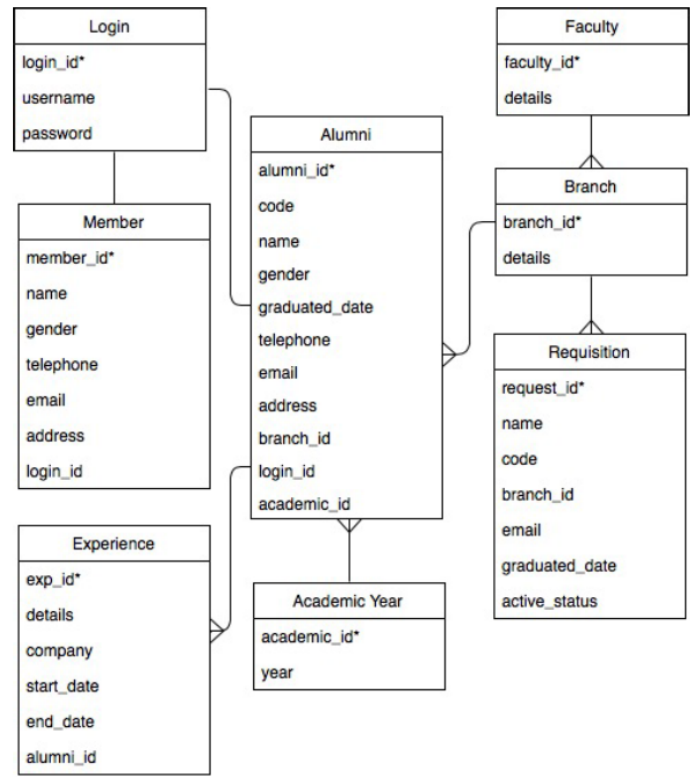


Fig. 6. Database schema.

#### E. Development

This phase focuses on development of web application and create database system. PHP language is used for calculating and manipulating data from database that manages by using phpMyAdmin. Data from original source file is filtered and loaded into alumni database. Source code file is divided into three groups that are eight classes (Model), ten views, and eleven controllers. For verifying input, solution of HTML5 and Bootstrap framework are active.

#### F. Testing and Maintenance

For a good efficiency of program, test process is defined to prove process of web application based on user requirements and clears bug and error of program before delivery [12]. After that, unit test and user acceptance test are operated by simulating virtual environment for user testing. User acceptance process is operated by using the questionnaires that are separated into three domains which consist of efficiency and benefit, design and service. Sample for testing includes administrator, member and alumni. Result of questionnaire is analyzed by using percentage and average.

### III. RESULTS

Research result represented two parts are web application and satisfaction survey following below.



ค้นหาข้อมูลศิษย์เก่า

ชื่อ หรือ รหัส: 2560 ปีการศึกษา: 2560 คณะ/สาขา: วิทยาศาสตร์และเทคโนโลยี สาขาวิชา: วิศวกรรมศาสตร์ ค้นหา

ผลการค้นหา [ 3 ]

ลำดับ	รหัสนักศึกษา	ชื่อ - สกุล	สาขาวิชา	วันที่สำเร็จการศึกษา
1	5612260055	สาธิตย์ อเนกหาญ	วิศวกรรมศาสตร์	13/09/2560
1	56122600205	อชิตา ปรีณิภา	วิศวกรรมศาสตร์	10/08/2560
1	56122600203	วิธยา กิ่งเงินจันทร์	วิศวกรรมศาสตร์	10/08/2560

Fig. 7. Results of search by general user.

Figure 7 pictures search result, retrieves from alumni database in the table that consists of student's code, name, branch and graduated date. Keyword for searching includes 2560 of academic year, faculty of science and technology, and major of home economics.

ค้นหาข้อมูลศิษย์เก่า

ชื่อ หรือ รหัส: 0 พ.ศ. ค.ศ. สาขาวิชา: ค้นหา

ผลการค้นหา

Show 10 entries

รหัส นักศึกษา	ชื่อ - สกุล	สาขาวิชา	วันที่สำเร็จการศึกษา	ที่อยู่	อีเมล
5287333031	สุพรรณ แซงทอง	รัฐประศาสนศาสตร์	19/05/2560	39 หมู่ 2 ถนนแจ้งวัฒนะ แขวงทุ่งต้อม เขตหลักสี่ กรุงเทพมหานคร 10240	sangranoo@gmail.com
53874740143	ปองเดช วัฒนชัย	สิ่งแวดล้อมศึกษา	28/04/2560	46/61 เขตปทุมธานี กรุงเทพมหานคร 10240	phongdej@hotmail.com
54123330203	กนกวัน วัฒนชัย	รัฐประศาสนศาสตร์	10/08/2560	31 หมู่ 4 ตำบลแวงหลวง อำเภอสว่าง 14150	oat44kat@hotmail.com

Fig. 8. Result of search by alumni.

For figure 8, search result of alumni and member differ from general user in terms of contacting details. The results demonstrated student's code, name, branch, graduated date and email of alumni.

ค้นหาข้อมูลศิษย์เก่า

ชื่อ หรือ รหัส: 501211212 ปีการศึกษา: 2550 คณะ/สาขา: วิทยาศาสตร์และเทคโนโลยี สาขาวิชา: วิศวกรรมศาสตร์ ค้นหา

ผลการค้นหา

Show 10 entries

รหัส นักศึกษา	ชื่อ - สกุล	สาขาวิชา	วันที่สำเร็จการศึกษา	ที่อยู่	อีเมล
501211212	อานนท์	เทคโนโลยีและนวัตกรรม			
2550	พรชัย ธีรอนา	ผลิต			
2561	สินพันธ์	คอมพิวเตอร์ (หลักสูตรนานาชาติ)			
2560	นันทิยา ธีรอนา	วิทยาศาสตร์			

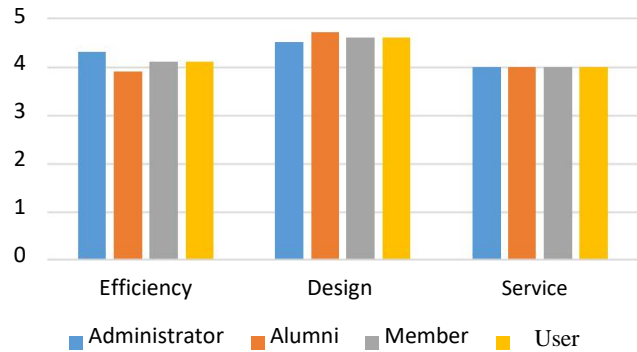
Fig. 9. Requisition improvement.

From figure 9 explains list of requisition detail which user enter through the web form. Administrator can change

pending (yellow) status when requirement generates to be approved (green) or rejected (red) status.

### B. Satisfaction Survey

For user acceptance test, researchers use satisfaction survey form for acquiring and gathering results. Twenty samples who are users as alumni and general users (member) are expected to answer the questions. Overall result is shown in figure 10 following below.



The overall summary of surveying illustrates that all types of users feel satisfied with design of web application ( $\bar{x} = 4.60$ ). Furthermore, this result has influenced on designing user interface by using Bootstrap framework as element. For capability of web application, users have been satisfied with performance of web application regarding to processing ( $\bar{x} = 4.10$ ), In service case, entire users are satisfied equally ( $\bar{x} = 4.00$ ).

## IV. CONCLUSION AND FUTURE WORK

This paper focus on developing database system via web application to encourage searching alumni details. In field of designing process, we have to gather and consider user's need so that user can meet the needs and develop system to become more efficient. Search function can depict primary alumni data such as student's code, student's name and normal user have the right to see. However, alumni and member can visualize fully information as contact, phone number and email. For managing requirement, web application has provided administrator function that can illustrate status of demand as approved and rejected. Filtering and transferring data from original database to alumni database by using ETL methodology influences the efficiency of web application. Anyway, Bootstrap framework have affected user's satisfaction and usability application. Regarding to web application improvement for alumni database system should adding BI module to analyze information for exclusive and director use it to make a decision. This web application also equip guidance of applying Data Warehouse technique to design and manage search module. If web application is used and well known extensively, it will gain tremendous information in its database. Accordingly, developer or data engineer will be able to take needed information for being developed to be Big Data further.

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# Risk assessment of Thai users disclosed Facebook's data privacy in each generation

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## Abstract

In the past, people exchanged information or news stories among a limited group of people. Nowadays, people use social networks as part of their daily life. Popular social networks include Facebook, Twitter, google+, LinkedIn, Pinterest, Instagram, Snapchat, Foursquare and Swarm. They are used to share the users' interests and their stories to their acquaintances, friends and family. Users often include sensitive personal information on their profiles. These social media platforms have expanded communication boundaries from small social groups to a global society. Social media has influenced modern life in many ways. People seek others who have the same interests, they create or join groups to talk about their experiences or to request assistance from others. In many cases they have never physically met people who are in the same groups, but they have joined them as they share the same interests. Many people are not concerned about their information which they make available online. They do not realize that every time they post messages, pictures, videos or share their location they put themselves at risk. They are creating trails and digital footprints on the internet which could be used to track them. This research, therefore, attempts to establish what Digital footprint will bring threats and vulnerability to Facebook users by assessment those risk. This study categorized threats and vulnerability from Thailand users behavior and seeks to understand differences between the generations. The research studied the behavior of "Baby Boomers", and generations X, Y and Z.

**Keyword:** Digital footprint, Electronic footprint, Digital shadow, Social media, Social network, Risk assessment, Data Privacy, Privacy

## I. INTRODUCTION

This research aims to assess risk of disclosed individual data on Facebook in Generation Baby Boomers, generation X, Y and Z in Thailand and identify potential threat events of Facebook digital footprint. Data of 200 Facebook users from all the four generations in Thailand who shared their profile and timeline posts to public were collected from July – September 2018. 50 users were selected from each generation. Measurement rates given by 8 security experts on the questionnaire for likelihood and impact assessment scale, generation risk weight and impact level of the data were used to identify risk in the collected data shared by the selected users. Criteria for profile sample are generation in Thailand who shared their profile and timeline post in public.

## II. RELATED LITERATURE

### A. Theory

Social media - Social media use web-based technologies, desktop computers and mobile technologies (e.g., smartphones and tablet computers) to create highly interactive platforms through which individuals, communities and organizations can share, co-create, discuss, and modify user-generated content or pre-made content posted online. They introduce substantial and pervasive changes to communication between businesses, organizations, communities and individuals[1]. Social media changes the way individuals and large organizations communicate. These changes are the focus of the emerging field of techno self-studies.

- Facebook: Founded in 2004, Facebook's mission is to give people the power to build community and bring the world closer together. People use Facebook to stay connected with

friends and family, to discover what's going on in the world. There are 1.37 billion daily active users on average for

September 2017 and billion monthly active users as of September 30, 2017 [2].

Facebook is a popular free social networking website that allows registered users to create profiles, upload photos and video, send messages and keep in touch with friends, family and colleagues. According to statistics from the Nielsen Group, Internet users within the United States spend more time on Facebook than any other website [3].

- Thailand Facebook Population: Research published in Digital in 2017 revealed that Thailand has 46 million registered Facebook users. 2% of the entire global Facebook usership and a huge percentage of the Thai population. Largest age group are 18-24 years old claim the top spot with 14.8 million users. 25-34 years old are a close second at 13.7 million users, and 35-44 years old are next at 7.3 million [4]. In the 12-month period between January 2016 and January 2017 the number of social media users in Thailand grew by an incredible 21%. With 46 million registered users in Thailand spending an average of almost three hours per day using social media [5]. The researcher used 4 related researches for data collection fields as in table I.

Understand social media's digital footprint - There are two main classifications for digital footprints: passive and active. A passive digital footprint is created when data is collected without the owner knowing, whereas active digital footprints are created when personal data is released deliberately by a user for the purpose of sharing information about oneself by means of websites or social media. [6]

- NIST Special Publication 800-30 and NIST Special Publication 800-30 Revision 1, Guide for Conducting Risk Assessments. The purpose of Special Publication 800-30 is to

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provide guidance for conducting risk assessments of federal information systems and organizations.

- ISO/IEC 27005:2011 Information technology -- Security techniques -- Information security risk management. It supports the general concepts specified in ISO/IEC 27001 and It is designed to assist the satisfactory implementation of information security based on a risk management approach. applicable to all types of organizations (e.g. commercial enterprises, government agencies, non-profit organizations) which intend to manage risks that could compromise the organization's information security.

#### B. Related research

TABLE I RELATED RESEARCHES FOR DATA COLLECTION FIELDS

SOURCE	TITLE
A	Studying Facebook and Instagram data: The Digital footprints software [7]
B	PEW INTERNET & AMERICAN LIFE PROJECT - Digital Footprints [8]
C	Studying User Footprints in Different Online Social Networks [9]
D	Risk Assessment in Social Networks based on User Anomalous Behaviours [10]

### III. RESEARCH METHODOLOGY

Prepare for Risk Assessment and Identification - Assess risk by apply Risk Management Guide for Information Technology Systems NIST SP 800-30 and SO/IEC 27005:2011. Comparison between NIST SP 800-30 which have 7 steps and ISO/IEC 27005:2011 which have 3 steps in risk assessment methodology.

TABLE II COMPARISON BETWEEN NIST SP 800-30 AND ISO/IEC 27005:2011 IN RISK ASSESSMENT

NIST SP 800-30, GUIDE FOR CONDUCTING RISK ASSESSMENTS.	ISO/IEC 27005:2011 INFORMATION SECURITY RISK MANAGEMENT
STEP 1 SYSTEM CHARACTERIZATION	RISK IDENTIFICATION
STEP 2 THREAT IDENTIFICATION	
STEP 3 VULNERABILITY IDENTIFICATION	
STEP 4 CONTROL ANALYSIS	RISK ANALYSIS
STEP 5 LIKELIHOOD DETERMINATION	
STEP 6 IMPACT ANALYSIS	
STEP 7 RISK DETERMINATION	RISK EVALUATION

In this research we combine NIST SP 800-30, Guide for Conducting Risk Assessments and ISO/IEC 27005:2011 Information Security Risk Management into the following steps.

1. Risk Identification
  - a. Identify scope
  - b. Identify information sources
  - c. Identify likelihood level
  - d. Identify impact level
  - e. Identify the risk matrix model and analytic approach

2. Risk Assessment and Analysis
  - a. Determine likelihood and impact level
3. Risk Determination and Evaluation
  - a. Determine level of risk result

### IV. EXPERIMENT RESULTS

#### A. Risk Identification

1. Identify scope – Scope of risk assessment is to identify risk from 200 users in Baby Boomers, X, Y and Z generation whose name in Thai, hometown or current town is in Thailand 50 users were selected from each generation.

2. Identify information sources – Collecting data from <https://www.facebook.com>. Data fields and description are in table III. Data collection fields categorized into user's information on their profile to public in highlight column and user post and tag to public in colorless column. These data collections are used throughout in this research.

TABLE III DATA FIELDS

NO	DATA FIELDS
1	Full Name
2	Email Address
3	Gender
4	Current Location
5	Hometown
6	Religion
7	Political View
8	Friends
9	Birthday
10	Address
11	Phone Number
12	Family Related
13	Education History
14	Work History
15	Facebook Groups
16	Relationship Status
17	Pages That User Liked
18	Movies That User Likes
19	Music That User Likes
20	Tv Shows
21	Feed Of Posts Including Status Updates By User
22	Post Events That User Is Interested To Go
23	Links Published
24	Live Videos Of User
25	Videos The Person Is Tagged In Or Uploaded
26	Photos The Person Is Tagged In Or Has Uploaded
27	Check-Ins

3. Identify likelihood level – Likelihood for assessment scale and description that threat events of concern fields result rates given by 8 security experts on the questionnaire. The probability assigned for each threat likelihood level is 5 for Almost certain, 4 for Likely, 3 for Possible, 2 for Unlikely and 1 for Rare.

TABLE IV ASSESSMENT SCALE – LIKELIHOOD OF THREAT EVENT

LIKELIHOOD LEVEL	DESCRIPTION
5 - Almost Certain	Threat event is initiated or occurs almost certain to occur; or occurs more than 295 times in 1 months.
4 - Likely	Threat event is initiated or occurs highly likely to occur; or occurs between 179 - 294 times in 1 months.
3 - Possible	Threat event is initiated or occurs somewhat likely to occur; or occurs between 66 - 178 times in 1 months.
2 - Unlikely	Threat event is initiated or occurs unlikely to occur; or between 10 - 65 times in 1 months.
1 - Rare	Threat event is initiated or occurs highly unlikely to occur; or occurs less than 9 times in 1 months.

4. Identify impact level – Impacts for assessment scale and description that threat events of concern fields result rates given by 8 security experts on the questionnaire. Most of impact of user profile data, sharing post and post tagged by others are harm to individual and others such as

- Cause threatens individual's serious injury or loss of life.
- Cause physical or psychological mistreatment. - Cause suffering from financial loss.
- Cause reputation impact to individuals or other persons.

TABLE V ASSESSMENT SCALE – IMPACT OF THREAT EVENTS

IMPACT LEVEL	DESCRIPTION
5 - Very High	The threat event could be expected to have multiple catastrophic effects on assets, individuals or other persons. - Possibly threatens individual's serious injury or loss of life. - Possibly of major physical or psychological mistreatment. - Possibly suffer from severe financial loss. - Cause severe reputation impact to individuals or other persons.
4 - High	The threat event could be expected to have a catastrophic effect on assets, individuals or other persons. - Possibly threatens individual's serious injury or loss of life. - Possibly of major physical or psychological mistreatment. - Possibly suffer from major financial loss. - Cause severe reputation impact to individuals or other persons.
3 - Moderate	The threat event could be expected to have a serious effect on assets, individuals or other persons. - Possibly threatens individual's injury that does not involve loss of life or serious life-threatening injuries. - Possibly of moderate physical or psychological mistreatment. - Possibly suffer from major financial loss. - Cause major reputation impact to individuals or other persons.
2 - Low	The threat event could be expected to have a limited effect on assets, individuals or other persons. - Possibly threatens individual's injury that does not involve loss of life or serious life-threatening injuries. - Possibly of moderate physical or psychological mistreatment. - Possibly suffer from minor financial loss. - Cause moderate reputation impact to individuals or other persons.
1 - Very Low	The threat event could be expected to have a negligible adverse effect on assets, individuals or other persons. - Possibly threatens individual's injury that result in insignificant harm to individuals. - Possibly of minor physical or psychological mistreatment. - Possibly suffer from minor financial loss. - Cause minor reputation impact to individuals, other persons.

5. Identify the risk matrix model – Identify the risk to the Facebook user from threat events of concern fields

considering: the impact that would result from the events; and the likelihood of the events occurring. Follow NIST Special Publication 800-30 Revision 1, Guide for Conducting Risk Assessments also include generation weight to be a risk weight indicator for each generation of Facebook users. Generation weight given by 8 security experts on the questionnaire as in table VI.

TABLE VI GENERATION RISK WEIGHT

ANSWER CHOICES	WEIGHTED
GENERATION BOOMERS : 1946 -1964 ( 72 - 53 YEARS OLD)	3.8
GENERATION X : 1965 -1980 ( 52 - 37 YEARS OLD)	2.8
GENERATION Y : 1981 - 1995 ( 36 - 22 YEARS OLD)	4
GENERATION Z : 1996 - PRESENT ( 21 YEARS OLD - Now)	4.6

The probability assigned for each threat likelihood level is 5 for Almost certain, 4 for Likely, 3 for Possible, 2 for Unlikely and 1 for Rare.

The value assigned for each impact level is 5 for Very High, 4 for High, 3 for Moderate, 2 for Low and 1 for Very Low.

The Weighted assigned for each is 3.8 for Generation Boomers, 2.8 for Generation X, 4 for Generation Y and 4.6 for Generation Z

**Risk rating = Likelihood level x Impact level x Generation weight**

5.1 Risk matrix model – There are generation weight factors that make risk matrix model in each generation have a difference risk weight so that this research divide risk matrix model into 4 model follow 4 generation as in table VII – X.

TABLE VII RISK MATRIX MODEL FOR GENERATION BOOMERS

Generation Boomers	Impacts				
Likelihood	1- Very Low	2 - Low	3- Moderate	4- High	5-Very High
5- Almost Certain	Low	Moderate	Moderate	Moderate	Moderate
4- Likely	Low	Moderate	Moderate	Moderate	Moderate
3- Possible	Low	Low	Moderate	Moderate	Moderate
2- Unlikely	Low	Low	Low	Moderate	Moderate
1- Rare	Very Low	Low	Low	Low	Low

TABLE VIII RISK MATRIX MODEL FOR GENERATION X

Generation X	Impacts				
Likelihood	1- Very Low	2 - Low	3- Moderate	4- High	5-Very High
5- Almost Certain	Low	Moderate	Moderate	Moderate	Moderate
4- Likely	Low	Low	Moderate	Moderate	Moderate
3- Possible	Low	Low	Moderate	Moderate	Moderate
2- Unlikely	Low	Low	Low	Low	Moderate
1- Rare	Very Low	Low	Low	Low	Low

TABLE VIII RISK MATRIX MODEL FOR GENERATION Y

Generation Y	Impacts				
Likelihood	1- Very Low	2 - Low	3- Moderate	4- High	5-Very High
5- Almost Certain	Low	Mode rate	Moderate	Mode rate	High
4- Likely	Low	Mode rate	Moderate	Mode rate	Moderate
3- Possible	Low	Low	Moderate	Mode rate	Moderate
2- Unlikely	Low	Low	Low	Mode rate	Moderate
1- Rare	Very Low	Low	Low	Low	Low

TABLE X RISK MATRIX MODEL FOR GENERATION Z

Generation Z	Impacts				
Likelihood	1- Very Low	2 - Low	3- Moderate	4- High	5-Very High
5- Almost Certain	Low	Mode rate	Moderate	Mode rate	High
4- Likely	Low	Mode rate	Moderate	Mode rate	Moderate
3- Possible	Low	Mode rate	Moderate	Mode rate	Moderate
2- Unlikely	Low	Low	Moderate	Mode rate	Moderate
1- Rare	Very Low	Low	Low	Low	Low

5.2 Description of Risk Level -These risk scale with its ratings represents the degree or level of risk which are Very High, High, Medium, Low, and Very Low,

TABLE XI ASSESSMENT SCALE – LEVEL OF RISK

Level of Risk	Quantitative Values	Description
5-Very High	96-100	Very high risk means that a threat event could be expected to have multiple severe or catastrophic on assets, individuals or other persons. Possibly threatens individual's serious injury or loss of life, major physical or psychological mistreatment. Suffering from severe financial loss and cause severe reputation impact to individuals or other persons.
4-High	80-95	High risk means that a threat event could be expected to have a severe or catastrophic on assets, individuals or other persons. Possibly threatens individual's serious injury or loss of life, major physical or psychological mistreatment. Suffering from major financial loss and severe reputation impact to individuals or other persons.
3-Moderate	21-79	Moderate risk means that a threat event could be expected to have a serious effect on assets, individuals or other persons. Possibly threatens individual's injury that does not involve loss of life or serious life-threatening injuries, moderate physical or psychological mistreatment. Possibly suffer from major financial loss and major reputation impact to individuals or other persons.
2-Low	5-20	Low risk means that a threat event could be expected to have a limited a limited effect on assets, individuals or other persons. Possibly threatens individual's injury that

Level of Risk	Quantitative Values	Description
		does not involve loss of life or serious life-threatening injuries, moderate physical or psychological mistreatment. Possibly suffer from minor financial loss and moderate reputation impact to individuals or other persons.
1-Very Low	0-4	Very low risk means that a threat event could be expected to have a negligible adverse effect on assets, individuals, other persons. Possibly threatens individual's injury that result in insignificant harm to individuals, minor physical or psychological mistreatment. Possibly suffer from minor financial loss and minor reputation impact to individuals or other persons.

### B. Risk Assessment and Analysis

- Determine Likelihood level -Determine the likelihood for assessment scale and description of threat events of concern resulted in adverse impacts, considering: the characteristics of Facebook fields that researcher manual collect data from 200 public user profile and post ( 50 users from each generations). Summary data collection fields in each generation and its number of posts since July - September 2018 result are in table XII.

Likelihood in user's information profile converted from 0 – 50 post scale into 0 - 5 level scale. For user post and tag in timeline converted number of post into 1 - 5 level scale. The 0 – 5 scale will be use in determine level of risk result.

TABLE XII SUMMARY LIKELIHOOD OF DATA COLLECTION FIELDS IN EACH GENERATION

Field	Generation Boomers	Genera tion X	Genera tion Y	Genera tion Z
Full name	50	50	50	50
Email address	3	0	0	9
Gender	50	50	50	50
Current location	23	28	40	38
Hometown	42	38	48	49
Religion	14	3	1	14
Political view	2	0	0	0
Friends	42	32	46	49
Birthday	33	25	33	40
Address	0	0	0	1
Phone number	0	0	0	7
Family related	11	36	49	35
Education history	20	31	30	42
Work history	32	41	41	7
Facebook groups	7	16	18	27
Relationship status	33	29	31	34
Pages that user liked	36	0	19	49
Movies that user likes	27	18	21	48
Music that user likes	27	18	21	48
TV shows	27	18	21	47
Feed of posts including status updates by user	906	128	442	1039
Post events that user is interested to go	21	10	13	42
Links published	1773	703	1976	3683
Live videos of user	5	2	16	98
Videos the person is tagged in or uploaded	10	6	53	152
Photos the person is tagged in or has uploaded	421	189	476	1547
Check-ins	51	60	278	473

- Determine Impact level - Determine the impact for assessment scale and description of threat events of concern result in adverse impacts, Measurement rates given by 8 security experts on the questionnaire. Impact of the characteristics of Facebook fields are in table XIII.

TABLE XIII IMPACT LEVEL OF DATA COLLECTION FIELDS

Field	Level of Impact
Full name	3.8
Email address	3.8
Gender	4.2
Current location	3.2
Hometown	2.4
Religion	3.2
Political view	2
Friends	2.4
Birthday	3.2
Address	3.2
Phone number	2.2
Family related	2.2
Education history	2.6
Work history	2.4
Facebook groups	2.4
Relationship status	2.4
Pages that user liked	2
Movies that user likes	2
Music that user likes	2
TV shows	2.2
Feed of posts including status updates by user	3.8
Post events that user is interested to go	3.4
Links published	3.2
Live videos of user	3
Videos the person is tagged in or uploaded	4.4
Photos the person is tagged in or has uploaded	3
Check-ins	2.8

### C. Risk Determination and Evaluation

Determine level of risk result - In this research is determine and evaluate risk for each Facebook user generation as follow. The risk level is determined based on the risk matrix model.

$Risk\ rating = Likelihood\ level \times Impact\ level \times Generation\ weight.$

In this research is exclude full name and gender from evaluate risk result as this two fields are required field. So that likelihood are always be level 5 and the risk level result are always the highest.

a. Generation boomers level of risk result – Risk level result for overall threat event is low risk level. Maximum risk level from user profile data field is Moderate. Birthday field is the highest risk percent score 32.10%. Maximum risk level from post and tag in user timeline data field is Moderate. Links published field is the highest risk percent score 23.68%.

TABLE XIV GENERATION BOOMERS RISK LEVEL RESULT

Field	Generation Weighted	Likelihood	Impact	Risk Percent Score	Risk Level
Full name	3.8	5.00	3.80	57.76%	Moderate
Email address	3.8	0.30	3.20	2.92%	Very Low
Gender	3.8	5.00	2.00	30.40%	Moderate
Current location	3.8	2.30	3.20	22.37%	Moderate

Field	Generation Weighted	Likelihood	Impact	Risk Percent Score	Risk Level
Hometown	3.8	4.20	2.40	30.64%	Moderate
Religion	3.8	1.40	2.20	9.36%	Low
Political view	3.8	0.20	3.20	1.95%	Very Low
Friends	3.8	4.20	2.40	30.64%	Moderate
Birthday	3.8	3.30	3.20	32.10%	Moderate
Address	3.8	0.00	3.80	0.00%	Very Low
Phone number	3.8	0.00	4.20	0.00%	Very Low
Family related	3.8	1.10	2.40	8.03%	Low
Education history	3.8	2.00	2.40	14.59%	Low
Work history	3.8	3.20	2.60	25.29%	Moderate
Facebook groups	3.8	0.70	2.40	5.11%	Low
Relationship status	3.8	3.30	2.20	22.07%	Moderate
Pages that user liked	3.8	3.60	2.20	24.08%	Moderate
Movies that user likes	3.8	2.70	2.00	16.42%	Low
Music that user likes	3.8	2.70	2.00	16.42%	Low
TV shows	3.8	2.70	2.00	16.42%	Low
Feed of posts including status updates by user	3.8	1.42	3.00	12.96%	Low
Post events that user is interested to go	3.8	0.03	3.80	0.38%	Very Low
Links published	3.8	2.78	2.80	23.68%	Moderate
Live videos of user	3.8	0.01	3.40	0.08%	Very Low
Videos the person is tagged in or uploaded	3.8	0.02	3.00	0.14%	Very Low
Photos the person is tagged in or has uploaded	3.8	0.66	3.20	6.43%	Low
Check-ins	3.8	0.08	4.40	1.07%	Very Low

b. Generation X level of risk result – Risk level result for overall threat event is very low risk level. Maximum risk level from user profile data field is Moderate. Work history is the highest risk percent score 23.88%. Maximum risk level from post and tag in user timeline data field is Low. Links published field is the highest risk percent score 17.45%.

TABLE XV GENERATION X RISK LEVEL RESULT

Field	Generation Weighted	Likelihood	Impact	Risk Percent Score	Risk Level
Full name	2.8	5.00	3.80	42.56%	Moderate
Email address	2.8	0.00	3.20	0.00%	Very Low
Gender	2.8	5.00	2.00	22.40%	Moderate
Current	2.8	2.80	3.20	20.07%	Moderate

Field	Generation Weighted	Likelihood	Impact	Risk Percent Score	Risk Level
location					
Hometown	2.8	3.80	2.40	20.43%	Moderate
Religion	2.8	0.30	2.20	1.48%	Very Low
Political view	2.8	0.00	3.20	0.00%	Very Low
Friends	2.8	3.20	2.40	17.20%	Low
Birthday	2.8	2.50	3.20	17.92%	Low
Address	2.8	0.00	3.80	0.00%	Very Low
Phone number	2.8	0.00	4.20	0.00%	Very Low
Family related	2.8	3.60	2.40	19.35%	Low
Education history	2.8	3.10	2.40	16.67%	Low
Work history	2.8	4.10	2.60	23.88%	Moderate
Facebook groups	2.8	1.60	2.40	8.60%	Low
Relationship status	2.8	2.90	2.20	14.29%	Low
Pages that user liked	2.8	0.00	2.20	0.00%	Very Low
Movies that user likes	2.8	1.80	2.00	8.06%	Low
Music that user likes	2.8	1.80	2.00	8.06%	Low
TV shows	2.8	1.80	2.00	8.06%	Low
Feed of posts including status updates by user	2.8	1.42	3.00	9.55%	Low
Post events that user is interested to go	2.8	0.03	3.80	0.28%	Very Low
Links published	2.8	2.78	2.80	17.45%	Low
Live videos of user	2.8	0.01	3.40	0.06%	Very Low
Videos the person is tagged in or uploaded	2.8	0.02	3.00	0.11%	Very Low
Photos the person is tagged in or has uploaded	2.8	0.66	3.20	4.73%	Low
Check-ins	2.8	0.08	4.40	0.79%	Very Low

c. Generation Y level of risk result – Risk level result for overall threat event is low risk level. Maximum risk level from user profile data field is Moderate. Current location is the highest risk percent score 40.96%. Maximum risk level from post and tag in user timeline data field is Moderate. Links published field is the highest risk percent score 27.20%.

d. Generation Z level of risk result – Risk level result for overall threat event is low risk level. Maximum risk level from user profile data field is Moderate. Birthday is the highest risk percent score 47.10%. Maximum risk level from post and tag in user timeline data field is Moderate. Links published field is the highest risk percent score 26.98%.

TABLE XVI GENERATION Y RISK LEVEL RESULT

Field	Generation Weighted	Likelihood	Impact	Risk Percent Score	Risk Level
Full name	4	5.00	3.80	60.80%	Moderate
Email address	4	0.00	3.20	0.00%	Very Low
Gender	4	5.00	2.00	32.00%	Moderate
Current location	4	4.00	3.20	40.96%	Moderate
Hometown	4	4.80	2.40	36.86%	Moderate
Religion	4	0.10	2.20	0.70%	Very Low
Political view	4	0.00	3.20	0.00%	Very Low
Friends	4	4.60	2.40	35.33%	Moderate
Birthday	4	3.30	3.20	33.79%	Moderate
Address	4	0.00	3.80	0.00%	Very Low
Phone number	4	0.00	4.20	0.00%	Very Low
Family related	4	4.90	2.40	37.63%	Moderate
Education history	4	3.00	2.40	23.04%	Moderate
Work history	4	4.10	2.60	34.11%	Moderate
Facebook groups	4	1.80	2.40	13.82%	Low
Relationship status	4	3.10	2.20	21.82%	Moderate
Pages that user liked	4	1.90	2.20	13.38%	Low
Movies that user likes	4	2.10	2.00	13.44%	Low
Music that user likes	4	2.10	2.00	13.44%	Low
TV shows	4	2.10	2.00	13.44%	Low
Feed of posts including status updates by user	4	0.68	3.00	6.52%	Low
Post events that user is interested to go	4	0.02	3.80	0.24%	Very Low
Links published	4	3.04	2.80	27.20%	Moderate
Live videos of user	4	0.02	3.40	0.27%	Very Low
Videos the person is tagged in or uploaded	4	0.08	3.00	0.78%	Very Low
Photos the person is tagged in or has uploaded	4	0.73	3.20	7.49%	Low
Check-ins	4	0.43	4.40	6.01%	Low



TABLE XVII GENERATION Z RISK LEVEL RESULT

Field	Generation Weighted	Likelihood	Impact	Risk Percent Score	Risk Level
Full name	4.6	5.00	3.80	69.92%	Moderate
Email address	4.6	0.90	3.20	10.60%	Low
Gender	4.6	5.00	2.00	36.80%	Moderate
Current location	4.6	3.80	3.20	44.75%	Moderate
Hometown	4.6	4.90	2.40	43.28%	Moderate
Religion	4.6	1.40	2.20	11.33%	Low
Political view	4.6	0.00	3.20	0.00%	Very Low
Friends	4.6	4.90	2.40	43.28%	Moderate
Birthday	4.6	4.00	3.20	47.10%	Moderate
Address	4.6	0.10	3.80	1.40%	Very Low
Phone number	4.6	0.70	4.20	10.82%	Low
Family related	4.6	3.50	2.40	30.91%	Moderate
Education history	4.6	4.20	2.40	37.09%	Moderate
Work history	4.6	0.70	2.60	6.70%	Low
Facebook groups	4.6	2.70	2.40	23.85%	Moderate
Relationship status	4.6	3.40	2.20	27.53%	Moderate
Pages that user liked	4.6	4.90	2.20	39.67%	Moderate
Movies that user likes	4.6	4.80	2.00	35.33%	Moderate
Music that user likes	4.6	4.80	2.00	35.33%	Moderate
TV shows	4.6	4.70	2.00	34.59%	Moderate
Feed of posts including status updates by user	4.6	0.74	3.00	8.15%	Low
Post events that user is interested to go	4.6	0.03	3.80	0.42%	Very Low
Links published	4.6	2.62	2.80	26.98%	Moderate
Live videos of user	4.6	0.07	3.40	0.87%	Very Low
Videos the person is tagged in or uploaded	4.6	0.11	3.00	1.19%	Very Low
Photos the person is tagged in or has uploaded	4.6	1.10	3.20	12.95%	Low
Check-ins	4.6	0.34	4.40	5.44%	Low

e. Generation Risk Level Comparison – Comparing risk level to all generation, Sort by highest to lowest risk level are Generation z, Generation y, Generation Boomers and Generation x. The highest risk level is Generation z. Maximum risk level from user profile data field is Moderate. Current location and hometown from user profile data field is the highest risk level shared in common fields to all

generation. Links published post and tag in user timeline field is the highest risk level shared in common fields.

TABLE XVIII GENERATION Z RISK LEVEL RESULT

Field	Generation Boomers	Generation x	Generation y	Generation z
Full name	Moderate	Moderate	Moderate	Moderate
Email address	Very Low	Very Low	Very Low	Low
Gender	Moderate	Moderate	Moderate	Moderate
Current location	Moderate	Moderate	Moderate	Moderate
Hometown	Moderate	Moderate	Moderate	Moderate
Religion	Low	Very Low	Very Low	Low
Political view	Very Low	Very Low	Very Low	Very Low
Friends	Moderate	Low	Moderate	Moderate
Birthday	Moderate	Low	Moderate	Moderate
Address	Very Low	Very Low	Very Low	Very Low
Phone number	Very Low	Very Low	Very Low	Low
Family related	Low	Low	Moderate	Moderate
Education history	Low	Low	Moderate	Moderate
Work history	Moderate	Moderate	Moderate	Low
Facebook groups	Low	Low	Low	Moderate
Relationship status	Moderate	Low	Moderate	Moderate
Pages that user liked	Moderate	Very Low	Low	Moderate
Movies that user likes	Low	Low	Low	Moderate
Music that user likes	Low	Low	Low	Moderate
TV shows	Low	Low	Low	Moderate
Feed of posts including status updates by user	Low	Low	Low	Low
Post events that user is interested to go	Very Low	Very Low	Very Low	Very Low
Links published	Moderate	Low	Moderate	Moderate
Live videos of user	Very Low	Very Low	Very Low	Very Low
Videos the person is tagged in or uploaded	Very Low	Very Low	Very Low	Very Low
Photos the person is tagged in or has uploaded	Low	Low	Low	Low
Check-ins	Very Low	Very Low	Low	Low

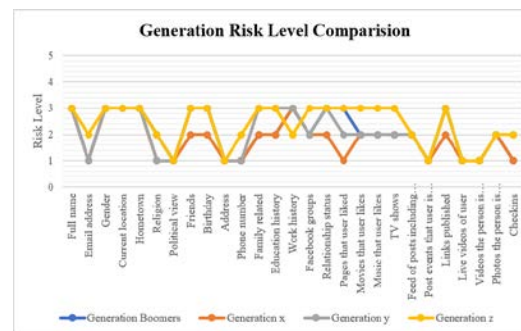


Fig 1. Generation Risk Level Comparison Chart

## V. CONCLUSION

The result of this research is that the results of this research show that generation z has the highest risk level result of left digital footprints trace, followed by generation y and boomers. Generation x has the lowest level of risk. The research incorporated generation weight by 8 security experts answer on the questionnaire. The knowledge and experience of using technology have effect on privacy settings on Facebook. Daily life style, social, education and work environment of Facebook user affect the level of risk of each generation in sharing information or leaving digital footprints trace.

It can be seen in the risk level result that sharing information and post on their timeline for Thai users have a low to very low risk level. Which mean that a threat event could be expected to have a limited or negligible effect on assets, individuals or other persons. Possibly threatens individual's injury that does not involve loss of life or serious life-threatening injuries, moderate physical or psychological mistreatment. Possibly suffer from minor financial loss and moderate reputation impact to individuals or other persons.

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# **Session of Medical Health Sciences and Laws**

# Efficacy of hair tissue based-therapy in male androgenic alopecia

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## Abstract

**Background:** A hair-tissue based therapy in androgenic alopecia was investigated. Harvesting hair increases the ability and interaction of healthy dermal papilla cells (DPCs) and their macro- and microenvironment to restore a pathologic balding scalp. This approach was found to be a new and promising concept of hair regeneration which deserves further investigation.

**Objective:** To evaluate the clinical efficacy of the intradermal injection of the autologous cellular suspension (ACS) acquired by mechanical centrifugation consisting of a heterogenous pool of cells rich in androgen-insensitive DPCs and their associated cells and cytokines in men with androgenic alopecia.

**Method:** Male patients with androgenic alopecia, aged 20 to 50 years and Hamilton-Norwood (NW) stage III-V vertex were enrolled in a study. They each attended one treatment session during which they received an intradermal injection of ACS at the balding vertex on their scalp. The efficacy was measured based on the change from the baseline in hair density and hair diameter at week 12. Photographic assessments by two investigators, who had not seen the patients, were carried out. Any adverse events were also recorded.

**Results:** Three male participants with mean (SD) age of 33.6 (4) years and NW stage for III vertex, IV and V were enrolled into the study. A significant increase in mean hair shaft diameter and decrease in vellus hair density were observed at week 12 in all patients. ( $P < 0.05$ ) A statistically significant improvement in the photographic assessment at vertex was also noted. Minor adverse effects that were recorded were minor pain and scalp pruritus at days 2 to 3 following treatment.

**Conclusion:** The hair-tissue based therapy using the intradermal injection of ACS has appeared to show good clinical efficacy in increasing mean hair shaft diameter and reducing the mean vellus hair density. This had a corresponding improvement in dermatologist global photographic assessment at vertex in male subjects with androgenic alopecia 3-months after treatment.

**Keyword:** androgenic alopecia, male pattern hair loss, dermal papilla cells (DPCs), cell-based hair regeneration

## I. INTRODUCTION

Androgenic alopecia (AGA) or male pattern hair loss is the most common type of non-scarring alopecia in the world including Thailand. The frequency and severity are steadily increased with age and about 50% of the Caucasian men develop androgenic alopecia by the age of 50 [1,2]. Pathomvanich D. *et al.* [3] have demonstrated that the prevalence of AGA in Thailand in cosmetically significant male pattern hair loss of Norwood-Hamilton classification of III-VII was 38.52% approaching that of Caucasians. The underlying causes of this patterned hair loss have yet to be determined. In men, it appears to be result from the combination of androgen hypersensitivity, genetic predisposition, and follicular microinflammation.

Nowadays, there are only two US Food and drug administration (FDA) approved medications of 5 $\alpha$ -reductase inhibitor, oral finasteride of 1 mg daily and topical minoxidil (2% solution, 5% solution and 5% foam) and a low-level laser light therapy (LLLT) that is the FDA-cleared device for the treatment of androgenic alopecia [4]. The available options show limited efficacy, associated with accelerated hair loss when the medications are stopped after prolonged use [5]. More to that, they also result in several unwanted side effects

such as skin irritation or finasteride associated sexual side effect including fertility problem [6]. While hair transplantation is another effective treatment of choice, it is rather invasive, expensive, time-consuming and limited by number of donor's available follicles.

Currently, the novel promising concept is the cell-based hair regeneration by using the selected potential multipotent stem cells. One that has caught particular attention is the dermal papilla cell as it plays an important role in embryogenic hair morphogenesis and hair cycle. Under an ideal micro- and macro- environment, dermal papilla cells maintain their inducing hair ability in which then causing the reentering of anagen phase through epithelial-mesenchymal cross-talk and generate hair growth [7].

In this study, the authors aimed to evaluate the clinical efficacy of the intralesional injection of the autologous cellular suspension (ACS) of a heterogeneous pool of cells rich in androgen-insensitive dermal papilla cells and their associated cells and cytokines demonstrated by the change from baseline in hair density and hair shaft diameter as primary endpoint and global photographic assessment by two

blinded dermatologists as secondary endpoint. Moreover, adverse side effects were recorded in every visit.

## II. METHODS

### A. Study design

This study was designed as a single center, semi-experimental, before and after pilot study to evaluate the clinical efficacy of the intralesional injection of the autologous cellular suspension (ACS) in men with AGA and was conducted at the outpatient dermatology clinic of Benchakitti Park Hospital between July 2018 and October 2018. This study was approved by the Human Ethics Committee of Thammasat University.

### B. Study participants

Three men aged 20 to 50 years, who have been diagnosed of AGA Norwood Hamilton stage III to V vertex by clinical and trichoscopic diagnosis of hair miniaturization more than 20% in vertex and less than 20% in occipital region with negative hair pulling test. Subjects were asked to maintain the same hair length, color and style during the study. Principle exclusion criteria are the use of topical minoxidil within 6 months, finasteride within 12 months and dutasteride within 18 months, light or laser therapy within 3 months or any other alternative miscellaneous treatments within 1 month. Subjects with chronic comorbidities such as diabetes mellitus, nutritional deficiency, autoimmune diseases, immunocompromised conditions, HIV-infection and cancer are also excluded.

### C. Methods

In this study, the human autologous hair tissue suspension procedure and preparation included the hair tissue harvesting, dissection, mechanical centrifugation, and intradermal injection. The donor hair tissues were obtained from occipital scalp according to the Unger's safe donor area. Six 2-mm punch biopsies were randomly done at selected occipital donor site in 1 cm interval and then were dissected for the dermal papilla, dermal sheath, inner and outer root sheaths including the bulge area, and the attached adipose tissues and discarded the epidermis and the hair shafts with surgical blade No.15 under stereomicroscope. After that, the acquired tissues were diluted with sterile normal saline, centrifuged according to the manufacture settings, and then apply to the cellular suspension to a 70  $\mu$ m pre-separation filter. The 5ml of homogenous autologous cellular suspension were subsequently obtained and injected exclusively into the vertex balding area in the interfollicular epidermis (0.1ml/cm<sup>3</sup>) in 1 cm apart at a depth of 5 mm. The bleeding at biopsy sites were stopped by manual compression. All the aforementioned procedures were done with the sterile technique under the biosafety cabinet type II.

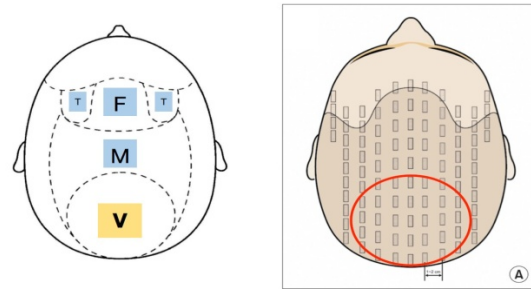


Fig. 1. Schematic design of human autologous hair tissue suspension protocol (Modified from Olsen EA. J Am Acad Dermatol 2001;45(Suppl):S70-80.)

TABLE I. BASELINE DERMOGRAPHIC DATA

	TOTAL (N=3)
<b>AGE (YEARS)</b>	
MEAN (SD)	33.6 (4)
<b>AGE HAIR LOSS FIRST NOTICED</b>	
MEAN (SD)	24 (5.6)
<b>DURATION OF AGA (YEARS)</b>	
MEAN (SD)	10 (2.3)
<b>NORWOOD-HAMILTON TYPE, N (%)</b>	
III VERTEX	1 (33.3)
IV	1(33.3)
V	1(33.3)
<b>HAIR DENSITY (HAIR/CM<sup>2</sup>)</b>	
MEAN (SD)	173.3 (5.7)
<b>HAIR DIAMETER (<math>\mu</math>M)</b>	
MEAN (SD)	40.7 (5.7)

### D. Assessments

The primary clinical efficacy endpoint was the change from baseline in the hair density and hair shaft diameter on the vertex at week 4 and 12 evaluated by 10-mm<sup>2</sup> target photograph (Dino-Lite microscope AM7013MZT [R4] Series; AnMo Electronics Corporation, Hsinchu, Taiwan). Focus area of quantitative trichoscopy will be taken on the same point by using the intersection line between the imaginary line from tip of the nose and ear implantation lines and then tattooed the area of 1 cm<sup>2</sup>.

The second clinical efficacy endpoint was the global photographic assessment evaluated by two treatment blinded investigators at week 4 and 12 using Fuji X-A2 digital camera; FUJIFILM Corporation, Japan. The paired photographs of baseline, week 4 and 12 were evaluated by two treatment blinded dermatologists based on 7-point rating scale (-3 = marked deterioration, -2 = moderate deterioration, -1 = mild deterioration, 0 =no change, 1 =mild improvement, 2 = moderate improvement, 3 =marked improvement).

The adverse events such as pain, pruritus, infection, or epidermal inclusion cyst formation were recorded in every visit for safety assessment.

#### E. Statistical analyses

The demographic data were analyzed using standard descriptive statistics. The change from baseline in hair density and hair shaft diameter and differences in global assessment scores were presented as mean (95% confidence interval). P-value corresponds to Paired t test with  $< 0.05$  was considered statistically significant.

### III. RESULTS

Among three male participants with AGA of mean (SD) age of 33.6 (4) years and NW stage for III vertex, IV and V were enrolled into the study. Baseline demographic data was shown in (Table 1).

#### Target photograph of quantitative trichoscopy

The primary clinical efficacy outcome from the target photograph of quantitative trichoscopy showed the significant improvement in hair shaft diameter. (Figure 4) At baseline, the mean hair shaft diameter was  $38.85 \pm 5.95 \mu\text{m}$  and continuously increased in size after the treatment. At week 12, the mean was  $43.84 \pm 8.09 \mu\text{m}$ , showing a significant increase in hair shaft diameter compared to that of baseline. ( $P=.028$ ) (Figure 2B) Consistent with the above-mentioned result, the mean vellus hair density was also significantly decrease from  $53.3 \pm 14.3 \text{ hairs/cm}^2$  at baseline to  $36.7 \pm 14.4 \text{ hairs/cm}^2$  ( $P=.038$ ) (Figure 3)

For the mean hair density, the results showed continuously increase in number from  $183.3 \pm 57.3 \text{ hairs/cm}^2$  at baseline to  $186.7 \pm 38 \text{ hairs/cm}^2$  at week 4 and  $196.7 \pm 94.1 \text{ hairs/cm}^2$  at the end of week 12 but not statistically significant. ( $P=.687$ ) (Figure 2A)

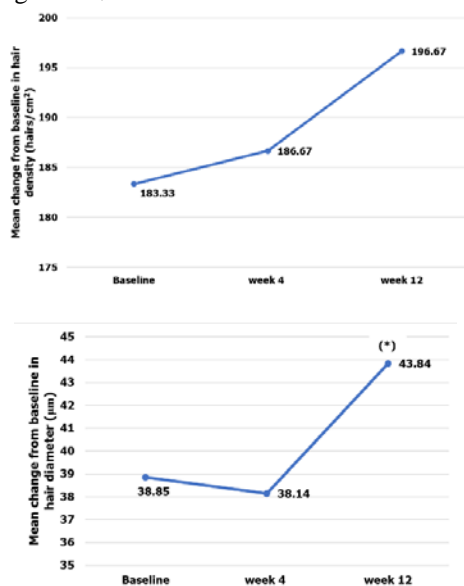


Fig. 2. Mean change from baseline in (A) hair density (B) hair shaft diameter; values are expressed as mean  $\pm$  SD, \* $p < .05$  is derived from the paired t-test.

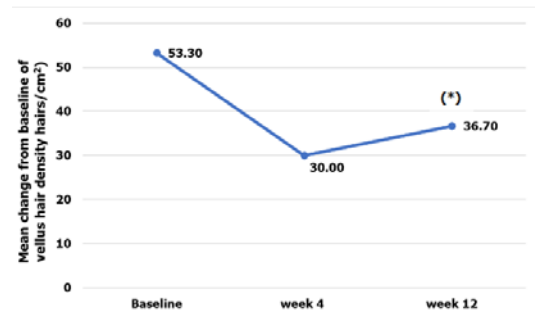


Fig. 3. Fig. 3 Mean change from baseline in vellus hair density; values are expressed as mean  $\pm$  SD, \* $p < .05$  is derived from the paired t-test.

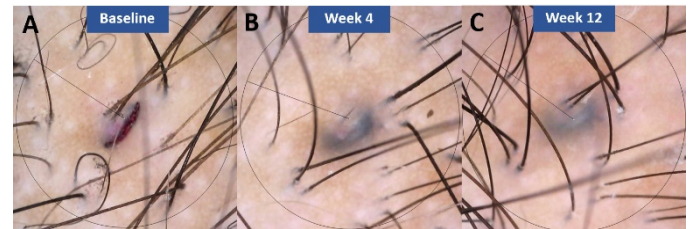


Fig. 4 Target photography for hair density and diameter assessment at (A) Baseline, (B) 4<sup>th</sup> week, (C) 12<sup>th</sup> week

#### Dermatologist global photographic assessment

The secondary clinical efficacy outcome of global photographic assessment at vertex and frontal scalp from two treatment blinded dermatologists showed significantly improvement at week 12 ( $P=.039$ ). (Figure 5) Two out of three participants showed moderate improvement and one participant was rated as showing marked improvement from baseline. (Figure 6)

On the contrary, the global photography at frontal did not show statistically significant improvement from baseline.

#### Safety and adverse events

All procedures are conducted under sterile technique under biosafety cabinet type II. There is no serious adverse event. All participants experienced mild pain and scalp pruritus at day 2 to 3 post treatment in which relieved without any topical or oral medication. No superimposed infection or epidermal inclusion cyst formation is noted.

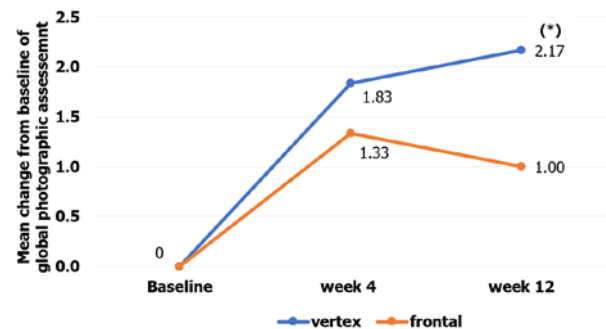


Fig. 5 Mean change from baseline of global photographic assessment; values are expressed as mean  $\pm$  SD, \* $p < .05$  is derived from the paired t-test.





Fig. 6 Global photography at Baseline, 4<sup>th</sup> week, and 12<sup>th</sup> week

#### IV. DISCUSSION

Androgenic alopecia (AGA) is one of the common hair disorders in men all over the world including Thailand. It often presents in the first decade after puberty and is characterized by a progressive, stereotypic pattern of hair loss with miniaturization of terminal hairs into vellus-like hairs. The hair loss typically starts as a symmetrical bilateral recession of the frontotemporal hairline. Over time, the vertex and mid-frontal regions are affected usually sparing the occipital area. This multifactorial hair disorder is believed to have three main etiologies; the influence of androgen, hereditary physical trait and follicular microinflammation in which results in the conversion of scalp terminal hairs into the progressive miniaturized vellus hairs and shortening anagen phase of hair follicle [8].

At cellular level, follicular miniaturization occurs during anagen cycles and is potentially caused by a diminution in dermal papilla volume, which in turn is affected by the androgen hyperactivity and genetic sensitivity to androgen.[9] The dermal papilla plays an important role in regulating keratinocyte cells in hair follicle growth and the determination of hair bulb matrix and hair shaft size[10,11]. In the presence of androgen, especially DHT, dermal papilla inhibits the growth of epithelial keratinocytes by secreting several cytokines including transforming growth factor  $\beta$ 1 in which result in miniaturized dermal papilla and compromised growth of the other hair follicular cells that ultimately result in a finer, unpigmented vellus like hairs. Dermal papilla is a main target hair follicle structure of androgen. Circulating testosterone enters hair follicles through dermal papilla's blood supply and catalyze by 5 $\alpha$ -reductase to DHT. When DHT binds to androgen receptors in dermal papilla cells, changes in gene transcription and protein expression are result [12]. Itami S. *et al.* [13] in vitro study had demonstrated that androgens stimulate proliferation of outer root sheath keratinocytes only when cocultured with beard DP cells but not nonbalding DP cells. Thus, the dermal papilla cells show the promising role of a possible therapeutic target for androgenic alopecia.

Dermal papilla cells (DPCs) have been noted to be a key element-cell for regenerating hair growth in previously bald skin [14] and as the main driver in embryogenic hair morphogenesis and hair cycle. The communication between DPCs, hair follicle cells and their micro- and macro-environment regulate different aspect of the hair follicle. Solanas G. *et al.* [15] discussed that the DP cells have to undergo substantial molecular changes preceding the

activation of hair follicles by expressing increased levels of several hair stimulating growth factors such as BMP inhibitors, FGF7, and FGF10. Altogether with WNT ligands also secreted by DPCs, they ultimately result in the activation of secondary hair germ cells that fuels the initial stage of anagen [16–19].

Based on our hypothesis, to provide the follicles with healthy androgen-insensitive DP cells with their associated micro- and macroenvironment and cytokines might reactivate the follicle to form a normal (terminal) hair. As anticipated, the results revealed significant increase in mean hair shaft diameter and reduction in mean vellus hair density as well as the improvement of dermatologist global photographic assessment after the hair tissue-based therapy of intradermal injection of ACS for 3-month follow-up time. By recreating a new suitable hair niche of DP cells which are now less susceptible to androgen hormone, we have speculated that the clinical improvements are correlated to the reverse of dermal papilla volume miniaturization which in turn result in the increased size of hair shaft in week 12. Unlike the aforementioned results, the mean hair density did not demonstrate the statistically significant change. This could be explained from the stimulation of new follicular formation might take longer time and further long-term follow-up are needed.

The concept to use DPCs as cell-based therapy is quite novel. Several successful construction of hair follicles in animal studies have been done in the past. Like many other cultured cell types, after a few population doublings in culture, DPCs lose their hair-inductive ability [20–24]. Since then, with more understanding of hair biology, several attempts have been made by co-cultivating them with their micro- and macro-environment. Reynolds AJ. *et al.* [25] and Inamatsu M. *et al.* [26] were successfully maintain hair inductive capability of DPCs by cocultured DPCs with epidermal keratinocytes and matrix keratinocytes as feeder cells respectively. For the importance of macro-environment component, hair follicles communicate with the subcutaneous adipose tissue during all stages of their cycling. While during telogen phase, mature adipocytes secrete BMP2 to inhibit the proliferation of hair follicle cells, the adipocyte progenitors contrastingly promoted the proliferation of bulge stem cells and to enter anagen by secreting the mitogenic molecule platelet-derived growth factor- $\alpha$  (PDGF $\alpha$ ) [27,28]. Other growth factors secreted by adipocyte stem cells (ASCs) include vascular endothelial growth factor (VEGF), TGF- $\beta$ , hepatocyte growth factor (HGF), placental growth factor, and bFGF are also demonstrated [29]. Such expression of potent growth factors allows ASCs give rise to their antigenic capacity, induce tissue neovascularization and provide suitable microenvironment to the dermal papilla to regenerate hair follicles. F. Zanzottera *et al.* [30] demonstrated the first attempt in our review in using the mechanical fragmentation in isolating the adipocyte derived stem cells from the remaining subcutaneous fat used in the hair transplantation

patients. The patients in this study underwent good recovery with reduction of post inflammatory swelling and edema. This latter study has confirmed the hypothesis that ASCs and their associated growth factors assist in healing process, hair regeneration and engraftment of transplanted hairs.

## V. CONCLUSION

In summary, this study has provided the proof of concept that by providing the androgen insensitive DP cells with suitable environment and associated cytokines that preserve the trichogenicity of hair stem cells to the pathologic follicles, can result in the reverse miniaturization of hair shafts and may subsequently result in the formation of new hair follicles in the long-term study.

This study is the first to my knowledge to demonstrate the quantitative primary and secondary outcomes of the change from baseline in hair density and hair shaft thickness and global photographic assessment in the hair-tissue based therapy of intradermal injection of ACS in male androgenic alopecia which can be a valuable stepping stone in the further histologic and/or molecular study. However, the limitations are that this is merely a pilot study with small sample size and long-term follow-up is suggested to verify the efficacy.

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# The strategic movement in health science's curriculum toward the professional development view: A case study of Thai dental school

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## Abstract

This case research illustrates the dental school's strategic movement in integrating their professional development courses with the technical curriculum offered in the past. It starts by giving an overview of the market conditions and technological trends that bring the need for the change in curriculum. Critical changes in terms of subject content, working structure, lecturer's expertise, and information support system are discussed. In this case, each agenda of change is analyzed by its current status and future challenges that will deliver a truly professional development program.

**Keyword:** healthcare development, curriculum change, Thailand

## I. INTRODUCTION

The rational of this study starts with a shifting paradigm of health care towards it being a market driven business that in turn leads to an issue of curriculum development. Moving beyond the clinical treatment itself, emerging concerns like service standards, competition, or even health tourism requirements continuously shape the new market conditions. For example, professional service systems, hotel-like environments, or even the requirement for Japanese-speaking dentists has become a common scenario in Thailand's private hospitals and clinics. In short, it is a movement towards business oriented and customer driven service. Within these conditions, the dentist's technical expertise might not be sufficient in the future since the service context also matters. In other words, they will require not only scientific knowledge but also service management knowledge that drives customer or patient satisfaction. To be competitive, the future dentist should also be capable of planning and implementing the service strategy in his/her workplace. In case of starting up own clinic, the dentist even has to learn to be a service entrepreneur. Since competitive service is a complex matter, an integrative set of concepts like customer satisfaction, effective communication, or even medical law is needed for professional development. To move forward, the remaining issue stays at the change management [1] toward this new dentist's mindset [2] as a service oriented profession.

In addition to service management, a number of emerging technological trends, especially in biotechnology [3], crucially call for innovation in dental curriculum. The increasing power of emerging biotechnology leads to a number of new drugs and medical equipments. For example, paracetamol and ibuprofen are dentist's typical choices for painkillers. However, alternative drugs (such as celecoxib and etoricoxib) with different therapeutic efficiency and safety profile are continuously launched to the market. With this condition, the dentist's current knowledge about painkillers might not be sufficient. In other words, any knowledge learned from class could be quickly obsolete. This sample scenario leads to the new requirement in term of life long learning skill.

In stead of passive learning, the good dentist in the future should possess some additional skills that enable him to effectively explore, evaluate and exploit new knowledge for enhancing treatment quality.

More specifically, the critical research skill becomes a crucial requirement for any future dentist to develop himself/herself toward the successful career track in an information era. Challengingly, it remains an issue of how to smoothly introduce this new mindset within the typical environment of well-established institute.

As mentioned above, a combination of market condition and technological trend [4] clearly calls for innovation in dental school's curriculum. Challengingly, the big agenda is to turn this innovative vision into the reality. Such rationale brings research question of how leading dental school copes and adjusts itself in terms of curriculum development.

## II. METHOD

The qualitative research methodology was adopted to explore strategic movement of Thai dental school to integrate the professional development courses with typically technical curriculum offered in the past. The purpose of this study is to look into curriculum development via single case study frame that is highly suitable for in-depth study of specific and unusual phenomena [5]. The chosen case represents full-fledged dental school, which is recognized as one of the finest institutes in Thailand. To collect data, in-depth interview were arranged with key members who engage in curriculum improvement with professional development courses infused. Interview data were framed in a comparative view between the current effort and future challenge in managing change toward new curriculum. Following Eisenhardt's method [6], this methodological approach aims to bring a theory from case study.

## III. CASE FINDINGS

The case findings illustrate the dental school's strategic movement in integrating the professional development courses with traditionally technical curriculum offered in the past.

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Critical changes in terms of subject content, working structure, lecturer's expertise, and supported information system are mainly discussed. In each area of change, a comparative explanation between the school's current effort and its future challenge was given as following;

#### *A. The subject content*

The school's current effort is to try for an introduction of management knowledge to the professional development classes. The basic principle or conceptual explanation regarding each management topic is the class's major attention. The basic concepts like introductory-level self management or service operation are selected in order to smoothly introduce the new subject content to the dental students (without much relevant background). These basic concepts also provide a good attraction to the new field [7]. To ensure student's understanding, the lecturer still has to pay much attention in giving conceptual explanation (lecture style).

The school's future challenge, however, goes beyond the introductory stage to the next stage of increasing diversity and applicability of management topics offered. Instead of relying only on basic management principle, the school should move to the next stage of incorporating more advanced and updated topics. The concepts of service innovation or even learning organization are the good examples of new topics which are closely relevant to the professional development objective. Furthermore, the mixture of conceptual explanation (broad one) with the specific application will be another challenge. More examples and case studies in healthcare will much increase the student's attention with a chance to understand management lessons from their own context of clinic or hospital management.

Comparing the school's current effort and future challenge, the first strategic gap exists. This gap requires the school's strategic movement toward more customization in term of subject content. Moving ahead, the management topic offered in professional development class should be highly customized to the health care professional's context with more relevant concepts and applicable case studies.

#### *B. The working structure*

The school's current effort covers mainly the initial development and operation of a new curriculum program under the pioneer team's whole responsibility. This structure's crucial characteristic is a small-size working team which runs under informal working style. Especially for start-up phase, a small-size working team usually brings the convenience and speed in information gathering, idea brainstorming, and final decision making toward the new professional development track. Similar to an entrepreneurial organization, the team's informal style enables the team member's flexible culture and open attitude toward any issue or conflict in curriculum development. In short, the dynamic progress of the new initiative is driven by this pioneer team's effort.

The school's future challenge, however, stays at the issue of how to expand for various stakeholders' involvement while keeping the existing entrepreneurial spirit in curriculum management. Since the new initiative will finally diffuse and create an impact to the massive society of health science, the voice of related stakeholders becomes a necessary option for

the program's continuous improvement. Instead of the pioneer team's sole decision, other parties such as students and lecturers (internal) or even hospital executives and patients (external) could provide any useful input for the new program too. In addition, the complexity in participative management also calls for more systematic but still flexible procedure to handle with various sources of input in the future.

Looking at the school's current effort and future challenge, the second strategic gap exists. This gap requires the school's strategic movement toward more collaborative approach in the area of working structure. To be more inclusive, the school's professional development initiative should be continuously improved through the various stakeholders' involvement [8] under the participative management system.

#### *C. The lecturer's expertise*

The school's current effort is mainly an issue of sourcing the external faculty members who could contribute their management expertise to the new learning program of health science's professional development. Since this new initiative requires a specific teaching skill (still very new for dental community), these faculty members are invited as the external experts coming under the part-time basis. While major advantages come from their solid conceptual knowledge in management field, some disadvantages still exist with their lack of specific experience in health care affairs. In this beginning stage, the part-time basis also enables the flexibility and variety of people who are selected to teach in the dental school's new initiative.

The school's future challenge, however, goes beyond the sourcing to the creating effort. With an expansion stage, the making of the skillful and committed internal faculty members will become the new program's priority in the near future. In stead of relying on only the external experts, the internal faculty member's new skills should be continuously incubated through organized teaching workshop and seminar. Furthermore, an incentive scheme in both monetary and non-monetary form should also be applied. The goal is to raise the importance of the professional development class in the internal faculty member's mindset. Ideally, it should be an internal priority to participate in the new initiative. This will be very challenging but more sustaining scenario.

Considering at the school's current effort and future challenge, the third strategic gap exists. This gap requires the school's strategic movement from an externally dependent to an internally grown expertise of teaching. In other words, it is a movement toward the self-reliance track. Crucially, an effort of internal skill incubation [9] will determine the sustainability of this new initiative in the future.

#### *D. The information system*

The school's current effort is to utilize the information system as a supporting tool in running a new professional development curriculum. In this beginning stage, this tool is mainly used in basic-level database work and data transaction of learning material. The teaching database contains learning content, media and example which are generally kept for internal usage. It allows only the responsible faculty members (within each department) to conveniently access any related material. The web based learning media is preliminary

constructed. Currently, it is still only used for basic data transaction such as updated class announcement and online homework submission. Broadly speaking, a good information technology infrastructure is available but still underutilized in this initial stage.

The school's future challenge, however, goes beyond basic operation to strategic usage of information system. The future scenario of information system should be viewed as a virtually inclusive and interconnected network of professional development community. The accession of teaching material should be expanded to serve the future growth of faculty member's community in professional development especially from different academic departments. In other words, it should be viewed as a faculty member's central repository or case bank. For the web-based learning media, it could be better utilized to stimulate teacher-learner's sharing transaction. The making of web-based community for professional development education is the prospected scenario.

Comparing the school's current effort and future challenge, the last strategic gap exists. This gap requires the school's strategic movement toward making virtual community through interconnected information system [10]. To move forward, the key issue is how to maximize the power of information technology for the purpose of building E-learning community in health science's professional development.

### III. CONCLUSION

This essay broadly illustrates the dental school's strategic movement toward the professional development view. The key theme is an integration of professional development subjects with traditionally technical curriculum offered in the past. Two crucial constraints are primarily mentioned as the reasons for change in dental curriculum. They include market condition and technological trend. These forces crucially lead to several progressive areas of change. These areas include a) subject content,

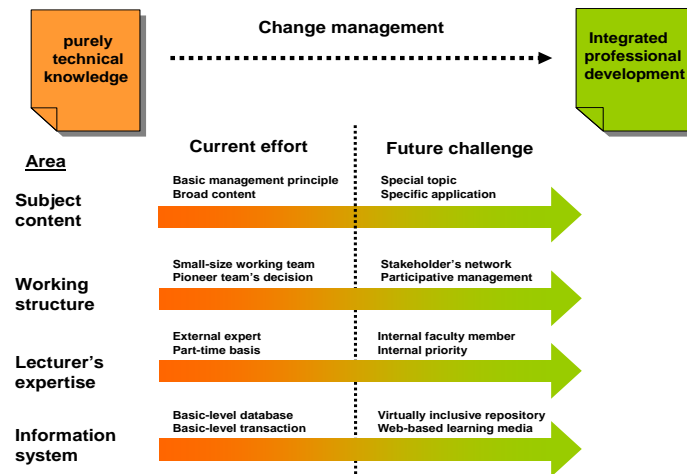


Fig. 1. The comparative points between current effort & future challenge.

b) the working structure, c) the lecturer's expertise, and d) the supported information system. As shown in Fig. 1, the comparative analysis reveals significant gaps between current situation and future challenge to be filled in for new program's sustainability.

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# Sustainable development and intellectual property

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## Abstract

Development that meets the needs of the present, without compromising the ability of future generations to meet their own needs is said to be ‘sustainable development’. This concept is closely linked with the protection of the environment. However, it is broader than just protection of the environment as it also has social and economic ramifications. Intellectual property rights also have a strong interface with sustainable development. This article is an attempt to analyse the role IPR should play to in order to aid sustainable development and to create a strong, healthy and just society. This article has a special focus on IPR allied areas surrounding sustainable development such as ethics of IPR, patent evergreening, public health, biopiracy, biodiversity, bio patents, food security, traditional knowledge and capacity building.

**Keyword: intellectual property rights, sustainable development, environment.**

## I. INTRODUCTION

The term “sustainable development” can be defined in many ways depending upon the context in which it is referred to. In international law, the concept of sustainable development has an ambiguous meaning and several distinct connotations.[1] Among these, the principle of integration and reconciliation of economic, social and environmental aspects functions as a core element. The notion of sustainable development arose in the context of environmental policy debates[3] The most common definition of this term can be found in the Brundtland Report which runs as “the development that meets the needs of the present without compromising the ability of future generations to meet their own needs.” This definition of ‘sustainable development’ indicates that there is something more to sustainable development than a mere simple link between environmental conservation and the economic concerns of the same. It is basically an approach to economic planning whereby attempts are made to foster the economic prosperity of a country while preserving the resources for the utilization by the future generations. More focus is on equity principles and the inter-generational considerations.

Intellectual property law, as the name suggests, is the law according protection to the property originated by the intellectual labor of the creator/author. It is primarily concerned with providing incentives to the creator /inventor community for the production of new, creative and applicable inventions, arts and knowledge. It stimulates innovation, design, and creation of new technology, ensures fair competition and protects consumers, by enabling them to make informed choices between various goods and services. While on the one hand, it provides consumers with new products enabling them to benefit from innovation, on the other, it provides the industry and innovators the incentive and means to finance research and development activities. Patents, copyright, industrial designs, trademark etc are most common kinds of intellectual properties. The basic philosophy behind the protection of intellectual property is to stimulate and encourage the inventors and creators. This is to bring continuous technological, scientific, industrial progress which

in turn results in economic benefits of the nation. The interface between the intellectual property rights and sustainable developments mainly due to patents based on bio-prospecting.

## II. IMPORTANCE OF SUSTAINABLE DEVELOPMENT

‘Sustainability’ is a broad discipline, which gives insights into most aspects of the human world from business to technology to environment and the social sciences. The notion of sustainable development is an umbrella concept under which most if not all activities seeking to jointly promote environmental protection, social development as well as economic development fit.[4] This concept assumes importance because its goals are not restricted to protecting resources for the future generation only rather it includes within its ambit the art of balancing the present competing interests of various communities of the world also. The concept of sustainability requires that the thirst to move forward technologically and economically should be balanced with the needs to protect the environment, protection of the indigenous communities playing key role in the environmental conservation. It requires assessment of long terms for their harmonious construction with the wholesome benefit of all, present and future. According to Brundtland Report the concept of sustainable development includes following two key concepts:

- the concept of “needs”, in particular the essential needs of the world's poor, to which overriding priority should be given; and
- the idea of limitations imposed by the state of technology and social organization on the environment's ability to meet present and future needs.

Wide interpretation to aforementioned two has made not only the environmental law much less specific in focus than what it used to be few decades ago but also broadened the concept of sustainable development beyond the field of environmental protection, conservation and the related policies and laws. One of the consequences is that international environmental law today addresses a number of links between

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environmental protection and other fields such as, trade, human rights and intellectual property.

### III. ENVIRONMENT AND INTELLECTUAL PROPERTY RIGHTS

In industrialized and developing countries alike, the interface between international intellectual property and environmental protection is widely perceived as one of fundamental conflict.[3] Issues like environmental protection, conservation of biodiversity, genetic resources and the need to protect IPR in relation to the context at hand has always been debatable worldwide. The developed nations, because of their geographical situations are not so rich in biological resources as compared to the developing and under-developed nations, which are extremely rich in forest and biological resources. Usually the indigenous community possessing Indigenous knowledge inhabits these biodiversity rich areas. These indigenous people possess very crucial information (traditional knowledge) which is essential for the conservation of environment, biodiversity and plant genetic resources. The indigenous communities/ local communities or the tribal people are the 'real managers' of natural habitats, the forests and the biodiversity. The indigenous community possessing indigenous knowledge inhabits the biodiversity rich areas. These indigenous people possess very crucial information as is essential for the conservation of environment, biodiversity and plant genetic resources. The indigenous communities/ local communities or the tribal people are the 'real managers' of natural habitats, the forests and the biodiversity. The biodiversity convention is an instrument in the direction of sustainable development, which aims at the conservation of biodiversity of the planet while serving for the development by making provision for an access to technology, including biotechnology.[5]

### IV. INTELLECTUAL PROPERTY RIGHTS AND SUSTAINABLE DEVELOPMENT

Sustainable development law has traditionally been largely separate from intellectual property protection. However, sustainable development is such a broad notion that legal frameworks in this area span a wide area which goes far beyond the original focus on environmental-related issues. As a result, even though sustainable development is not directly concerned with the promotion of technological development, a number of links with intellectual property protection have developed over time. This makes sustainable development law a primary subject of enquiry in addressing the links between technological development and environment and social issues. Over a last couple of years, there have been debates regarding policies relating to intellectual property rights and its nexus with the development specially the sustainable development. The first Bellagio Dialogue was convened in 2002, in which an agenda was set for development-oriented IP policy.[4] The dire need for tailoring of IP systems to promote sustainable development worldwide was highlighted.

The various efforts towards sustainable development and its IPR nexus at international level can be found in the various international instruments dealing with the recognition and protection of indigenous people's rights like 'Declaration on the Rights of Indigenous Peoples'. Further, the 'Convention

on Biodiversity' and the 'Rio Declaration' etc which though directly relates to environmental concerns but indirectly acknowledges the role played by the indigenous community in conserving biodiversity and in turn the conservation of the environment and the extreme need to protect their rights from being violated in the garb of IPR protection to products which are sheer results of biopiracy. The post TRIPS era reveals many cases of biopiracy and misappropriation of traditional knowledge by the developed world. Developing countries like India, Brazil, and Malaysia has suffered several cases of biopiracy. Several MNCs have obtained patents based on biological materials belonging to bio-rich countries without acknowledging the source or sharing the benefits.[5] For example: the Neem controversy between US and India, the Turmeric case, the Basmati Rice case, Amazonian ayahuasca case, South African Hoodia Gordonii, Bolivian quinoa, brazillian berries, Mexican enola beans etc. reveal how intellectual property is being created by MNCs by misappropriating traditional knowledge and bio resources of other nations.

Similarly, the in Pharma patents exists unethical practices such as ever-greening of patents which threatens the public health system of lower and middle income countries challenging the human right doctrines such as right to have access to medicine. It affects availability and affordability of medicines in the poor countries.

### V. SUPREME COURT OF INDIA ON SUSTAINABLE DEVELOPMENT

The recognition of the principle of 'sustainable development' as part of our national environmental regime begins with *Vellore Citizens Welfare Forum vs. Union of India & Ors* wherein the Supreme Court of India utilized the PIL filed before it as an opportunity to recognize the sustainable development principle as integral part of environmental development in India. It is submitted that any developmental activity should always be tested on the touchstone of sustainability principle.

Another important case in this regard is the *Intellectual Forum, Tirupathi vs. State of A.P. & Ors.*, wherein it was stated by the Court thus:

"... it seems fit to hold that merely asserting an intention for development will not be enough to sanction the destruction of local ecological resources. What this Court should follow is a principle of sustainable development and find a balance between the developmental needs which the respondents assert, and the environmental degradation, that the appellants allege."

### VI. CONCLUSION

IPR plays a major role in the realms of public health, food security, traditional knowledge, biodiversity and biotechnology which are also the key factors in the environmental discussions and sustainable development. The WTO and TRIPS (agreement on the trade related aspects of intellectual property rights) have mandated the global community to abide by TRIPS provisions. However, the TRIPS provisions and international IPR laws place 'haves' in an advantageous position while the stringent IPR provisions in TRIPS are prejudicial to the 'havenots'. On the pretext of '

Access to biogenetic resources' the developed nations are plundering the biodiversity and traditional knowledge of the developing and least developing countries as happened in the above mentioned cases such as Indian Turmeric, Indian Basmati Rice, Amazonian Ayahuasca, South African Hoodia Gordonii, Bolivian quinoa, Brazzian berries, Mexican enola beans etc. Unfortunately, international IPR laws such as TRIPS, totally ignores and excludes any discussion of the same nature. This situation has not only legal but social, political and economic impact for the have-nots. The post TRIPS negotiations and TRIPS plus discussions should necessarily address this concern. One single IP model does not respond to the development concerns of have-nots. The bio rich and green countries must utilise TRIPS flexibilities as opportunities for tailoring national IP systems to promote sustainable development. The need exists to rebalance IP policies, at all levels, by taking into account the interests of have-nots. The capacity building of indigenous / traditional people and people of poor countries especially those who conserve and preserve the biological diversity must be considered legally as an integral part of IPR system. There must be stringent and enforceable international norms protecting the bioresources and associated traditional knowledge. Then only fine balance between intellectual property, environment, sustainable development and human rights can be achieved. This is what demanded by UNSDG as global community's commitments to improve human lives and protect the environment.

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# An Insulin-Friendly Lifestyle for Optimal Health and the Prevention of Hyperinsulinemia, Metabolic Dysfunction, and Insulin Disease

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## Abstract

Elevated insulin levels and suppressed glucagon have been linked as leading causes of chronic disease and metabolic dysfunction. An “insulin-friendly” lifestyle (“IFL”) can optimize wellness and prevent hyperinsulinemia which leads to metabolic dysfunction and chronic diseases. In a two-year continuation study (2016-2018), an adult male followed an IFL designed to control insulin levels and activate glucagon. Methods for an insulin-friendly lifestyle outlined in this paper included a balanced diet of whole real natural foods, the consumption of healthy beverages, daily exercise, and stress management. No medications or supplements were used. The subject underwent a variety of medical tests to determine his general health and metabolic function. The results showed that an IFL optimized wellness, prevented hyperinsulinemia, and reduced the risks of chronic disease. The subject maintained a normal weight and waist-to-height ratio. Test results were within normal ranges for fasting and postprandial insulin and glucose levels, HbA1c, CRP, HDL, triglycerides, liver function enzymes, and other risk markers. By controlling insulin, the subject was able to activate glucagon and generate signaling pathways involved in the body’s repair, autophagy, longevity, and survival mechanisms. The study concludes that individuals who follow an IFL can enjoy optimal health and vitality. Furthermore, governmental institutions and national associations adopting a policy of IFL promotion can optimize the health of the population, reduce health care costs, and improve treatment options for those already suffering with chronic disease.

**Keywords:** Fatty Liver, Glucagon, Hyperinsulinemia, Insulin, Insulin Resistance, Metabolic Syndrome

## I. INTRODUCTION

Elevated insulin levels and inactive glucagon have been identified as a leading cause of chronic disease and metabolic dysfunction.[1] In a previous study beginning after 2008, a 56-year-old male followed an insulin-friendly lifestyle (IFL) to improve his health. The subject lost 30 kg, maintained basal metabolic rate, and reduced markers associated with the risks of chronic diseases.[2] In this continuation study from 2016 to 2018, the same subject, now 66 years old, continued to follow an IFL to assess its effectiveness in maintaining a healthy weight and overall wellness, and in reducing risk factors associated with the onset of chronic diseases.

The goal of this continuation study was to determine the efficacy of controlling insulin and activating glucagon by following an IFL to promote wellness and to reduce the risks of metabolic dysfunction and chronic disease. The benefits of modulating these hormones were summarized in a 12-hour video produced in 2014 by this author (who is also the subject in this study). The video reviewed opinions by medical doctors, researchers, and professors from all over the world.[3] These medical experts presented data showing that chronically-elevated insulin, called hyperinsulinemia, leads to metabolic dysfunction, inflammation, adipokines, oxidative stress, advanced glycation end-products (AGEs), elevated blood pressure, non-alcoholic fatty liver disease (NAFLD), elevated glucose levels, hormone imbalances, weight gain, fat storage, inhibition of glucagon signaling, visceral fat, metabolic syndrome, and insulin resistance. This author refers to all the aforementioned conditions, collectively, simply as “insulin disease.” Focusing on prevention, the video discussed

ways to lower insulin levels, activate glucagon, lower triglycerides, boost high density lipoprotein levels (HDL),

lower blood sugar, and prevent chronic diseases such as hypertension, heart disease, diabetes Type 2, obesity, liver disease, Alzheimer’s, cancer, Polycystic Ovarian Syndrome (PCOS), macular degeneration, all of which were characterized in the video as being just one disease with different names and occurring in different parts of the body. Numerous studies have reached similar conclusions, finding hyperinsulinemia a leading cause of cardiovascular disease; the metabolic syndrome;[5] the unifying theory of chronic disease;[6] and, the driving force behind diabetes Type 2 and heart disease.[7]

Given insulin’s central role in metabolic dysfunction, this study focused on whether or not following an IFL can promote wellness, reduce risk factors associated with the onset of chronic diseases, and activate glucagon in order to stabilize energy metabolism, promote healthy gene expression and signaling pathways, improve mitochondria function, and balance other hormones.

## II. METHODS

The subject followed an IFL which included a balanced diet, healthy beverages, daily exercise, and stress management. The diet was composed of whole real natural foods and beverages which were minimally processed and free of such things as artificial additives, growth hormones, antibiotics, pesticides, and GMOs. The subject ate twice a day (generally mid-morning and late afternoon). Foods were selected and prepared to maximize nutrition, to have a low glycemic load, and to have a low impact on insulin. At every

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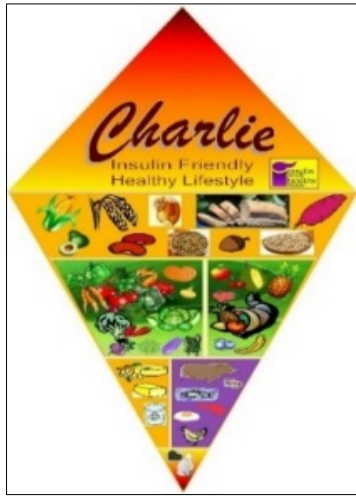


Fig. 1. IFL Friendly Foods

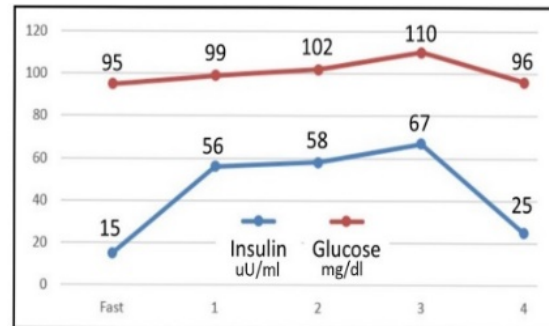
meal, the subject enriched the meal with certain whole foods which were high in fat-soluble vitamins (A, D, E, and K2), Vitamin C, trace minerals, fiber, and phytochemicals. Macronutrients were split in proportion to the six food categories as shown in Figure 1. The foods included whole grains, beans (except soy), tubers, avocados, nuts, seeds, fruits, vegetables, dairy products, and animal products. No attempt was made to weigh or measure portions and calories, nor to determine any exact ratio among the macronutrients other than to follow the relative size of each food category as shown in Figure 1. Most foods were from local sources and seasonal. Grains and seeds were soaked and fermented, especially for making a sourdough 100% whole grain and seed bread shown in Figure 1. Fermenting the bread reduced the natural sugars and maximized nutrition. Each meal included probiotic-rich homemade fermented vegetables (made out of beets, cabbage, and bell peppers), plain yogurt and cheese, and fermented beans. Beverages consisted of ozonated water (ozone removes glyphosate and many other pollutants), tea, coffee (with homemade fresh almond milk), and fermented juices. Alcohol use was very rare. Daily exercises included an hour of swimming every morning before breakfast in a chlorine-free ozonated pool (kept cold to stimulate brown fat cells), fast walks, and some resistance training. Stress management included socializing, walking, studying challenging new subjects, listening to music, watching old movies, getting adequate sleep, and minimizing inflammatory factors such as heavy metals, EMF radiation (including blue light), and poor dental hygiene. Sunlight was the main source of Vitamin D and other metabolites. No medications or supplements were



Fig. 2. Ozone for Drinking Water and Swimming Pool

Test	2008	2014	2016	2018
HbA1c %	N/A	5.3	5.2	5.2
CRP mg/l	N/A	0.95	0.69	0.89
TG mg/dl	129	42	63	81
HDL mg/dl	35	56	53	50
AST (SGOT)	36	20	22	21
ALT (SGPT)	50	16	18	16
Fatty Liver	Mild	Neg	Neg	Neg
CAC Score	N/A	N/A	N/A	2

Fig. 3. Blood Tests & Scans



4. Insulin and Glucose Levels



Fig. 5. Subject in 2008 versus 2018

included. The subject abstained from all refined sugars, processed flours (effectively excluding more than 99.99% of all grain products), and processed foods which the author believes are stripped of natural fiber and nutrients, and which allow simple sugars to be absorbed too quickly into the blood stream (causing insulin spikes) and the creation of glycation end-products. The subject avoided industrial vegetable and seed oils (PUFAs) subjected to high heat, pressures, and solvents to minimize oxidized fatty acids which cause inflammation, damage to cell structures, and atheromatous plaques.[8] The target Omega 3 to Omega 6 ratio was one to one. A top priority was modulating insulin and glucagon in order to signal the body's repair, autophagy, and survival mechanisms (discussed below).

While not formal participants in the instant study, the author wishes to mention three ladies, ages 30, 37, and 55 respectively, who adopted an IFL for a brief period of time within the past year and who were in being counseled by the author of this study. These three ladies followed the IFL to

varying degrees and lengths of time, often eating two meals a day and staying active by either working in the field or doing some exercises.

As much as possible, the IFL was designed to be in harmony with the Laws of Nature (to the extent mankind's knowledge has evolved) and the building blocks of life itself as profoundly explained in Quantum Field Theory (QFT). At the fundamental level, QFT teaches that particles are but excitations, ripples, in quantum fields ... fields which have shaped and defined human evolution. These fields interact to form electrons, protons and neutrons (from quarks), atoms, molecules, and cell structures in a sea of quantum foam in the "vacuum" of existence. Being "friendly" to insulin would naturally call for a lifestyle which is in accord with these building blocks of Nature. Maintaining the well-being of the electron transport chain, the production of ATP, the synthesis and repair of DNA, the integrity of telomeres and cell receptors, etc., are all biological processes which require considering how a given activity (be it selecting, preparing, or consuming certain foods or beverages, exercising, or managing stress) impacts insulin and glucagon. Staying as close as possible to what is natural and preserving the delicacy and coherence of the quantum fields and life-giving molecules defined the IFL followed in this study.

### III. RESULTS

Adopting an IFL optimized wellness, prevented hyperinsulinemia, and reduced risk factors associated with metabolic dysfunction and insulin disease. There were no signs of the metabolic syndrome (a cluster of conditions which includes high blood pressure, high glucose levels, visceral fat, low HDL, and elevated triglycerides). Tests for fatty liver were negative. The subject's weight (72 kg) and waist-to-height ratio (1/2) remained within normal ranges. Levels of fasting and postprandial insulin and glucose, measured each hour over a four-hour period after eating a typical IFL meal, were normal. Tests for inflammation, glycated hemoglobin, liver function enzymes, echocardiogram (EFLV 70%), coronary artery calcium scan (CAC score: 2), blood pressure (106/56), and heart rate (54) were all within normal ranges. Taken together, the results showed evidence of physiological adaptations to the composition, type, and timing of meals and exercises. Figure 3 shows actual results of laboratory values in this study as compared with the subject's journey to better health starting in 2008 to the present. Figure 3 shows test results of fasting and postprandial levels for insulin and glucose following an IFL meal.

As for the three ladies who tried the IFL, the results were as followed: The younger two ladies each lost 3 kg (from 57 kg to 54 kg and 54 kg to 51 kg, respectively). Neither lady was aware or suffered from any discernable health problems other than that both just wanted to lose a "little weight." After reaching their target weight, both ladies relaxed their efforts to follow an IFL in a strict manner. Both explained that she wanted to resume eating whatever and whenever they wanted. Each followed the IFL for about 3 months and lost approximately 1 kg per month. As of this writing, both have regained some of their weight, but have integrated many of the IFL concepts into their daily lives and report they intend to resume following an IFL and its core suggestions for the rest

of their lives. The oldest lady (aged 55 and mother of two grown children) has been following an IFL for 5 months, as of the date of writing this paper, and has lost 5 kg (from 76 kg to 71 kg) - also about 1 kg per month. Previously, she reported various health issues, including obesity and diabetic pathology with fasting glucose levels in the 180 to 200 mg/dl range. Although a full medical exam was not conducted at the start of her adopting an IFL due to the informal nature of her initiating the new lifestyle (for example, she did not attend any seminars or stock all the IFL foods and beverages one would normally want to have available to follow an IFL), she has shown some good results. As of this writing, she reports an increase in energy, regularity, stamina, and overall enthusiasm for an IFL. During a recent health check-up, her doctor told her that her fasting blood sugar level was 88 mg/dl and had succeeded in losing weight. It is hoped that a formal study of these three ladies can be implemented next year

### IV. DISCUSSION

A review of the male subject's medical tests showed that following an IFL promotes wellness, minimizes metabolic dysfunction, and reduces the risk of chronic diseases. An IFL provides optimal nutrition and gut health, both important factors in maintaining energy levels and controlling cravings in between meals, helped in no small measure by a healthy microbiome of intestinal bacteria and other organisms which an IFL provides. An IFL lowers both the level of insulin and the length of time it remains elevated. Low levels of insulin

activate glucagon which directly or indirectly stimulates repair and longevity signaling pathways. Glucagon acts like the director of a "metabolic" symphony which orchestrates intricate signaling pathways, other hormones (such as leptin and ghrelin), gene expression, enzymes, transcription factors, and biological reactions involved in cell repair and organ function. The idea of glucagon and the metabolic symphony working together is this author's concept he calls the "GG effect," or simply "GG" for short. In summary, GG stands for a cascade of survival mechanisms initiated during times when insulin is low (normally because food is not, intentionally or unintentionally, available and because other lifestyle factors together are activating glucagon). The survival mechanisms include releasing energy from fat, maintaining energy levels by keeping basal metabolic rate stable, repairing DNA and cellular organelles, and activating longevity metabolites. The GG effect occurs only when insulin is low. Biologically, the pancreas senses low insulin levels and releases glucagon into



Fig. 6. GG Metabolic Symphony

the blood, which in turn activates all the other survival mechanisms. GG recycles damaged proteins and cells (autophagy), repairs useful cells and enhances mitochondrial function, removes visceral fat from the heart, liver, pancreas, and other organs, and helps these organs function normally. GG can act like a powerful natural medicine and, in many cases, the only “medicine” available to treat fatty liver, visceral fat, obesity, metabolic syndrome, and insulin resistance.

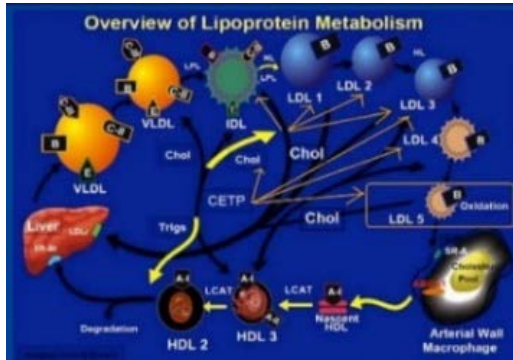


Fig. 7. Modified sdLDL (by Ken Sikaris)

GG reduces inflammation of the cardiovascular system by lowering the number of modified “sdLDL” particles (dangerous oxidized and glycated remnants of the larger buoyant LDL particles). Research shows that atherosclerosis (a condition in which plaque builds up inside the arterial walls) is not caused by dietary cholesterol or by healthy LDL particles, but by the body’s immune response to modified sdLDL particles,[10] which generate an inflammatory response by macrophages leading to plaque formation if not quickly removed.[11] Many medical experts believe that failing to discriminate between healthy LDL particles and modified sdLDL as the cause of heart disease is a fundamental error of modern medicine and has led to unnecessary and unsuccessful treatments. They cite studies showing that 50% of all heart disease incidents involve patients with “normal” LDL cholesterol levels.[12]

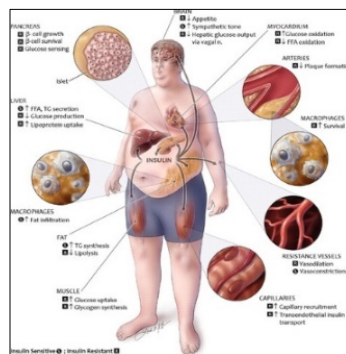


Fig. 8. Insulin Signaling (from the Rask-Madsen’s Study)

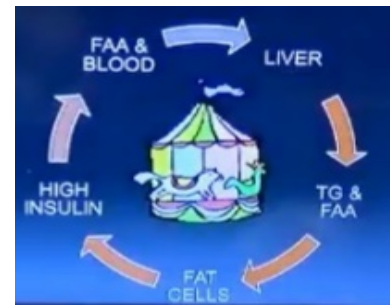


Fig. 9. Never-Ending Cycle of TG and Fatty Acids

Controlling insulin and activating GG helps maintain organ function and balance hormones. For example, women can prevent PCOS by modulating insulin and GG to balance the hormones estrogen, follicle stimulating hormone (FSH), luteinizing hormone (LH), progesterone, and testosterone, the imbalance of which can lead to PCOS,[13] problems relating to fertility, and even risks of diabetes and obesity to children of insulin-resistant mothers. Men can prevent Penile Erectile Dysfunction (PED) by keeping their cardiovascular system healthy. Similarly, GG can preserve the microvasculature of the heart (IV Septum), kidneys, and brain, protecting it from Alzheimer’s disease (which some doctors call Type 3 diabetes)[14] by repairing and recycling proteins and fats essential for cognitive function. GG can prevent many cancers, too, because many medical experts believe it to be driven by metabolic dysfunction.[15] GG prevents unregulated cells from proliferating by disrupting their access to nutrients such as glucose, glutamine (and other amino acids), and fatty acids. GG also inhibits the growth of blood vessels which feed such rogue cells and targets them for destruction and recycling before they can spread.[16] New research also shows that cancer cells, when weakened by GG, are more susceptible to conventional cancer therapies. Can GG cure cancer?

Well maybe, but not in the conventional sense. Cancer, or the unregulated growth of rogue cells, is occurring all the time everywhere in the body. Rogue cells, too small to be detected by any scan or missed by a biopsy, are always proliferating and causing mischief. In this author’s opinion, no power on Earth can cure cancer as long as humans remain as breathing biological units. Only a vigilant immune system and a healthy metabolic constitution fostered by an insulin-friendly lifestyle can stop cancer from gaining a foothold and spreading throughout the body.

GG improves the immune system not only to fight cancer, but to fight infections of all kinds, too. First, GG reduces AGEs which not only destroy cell membranes, proteins, receptors, etc., but also infection-fighting white blood cells. Second, GG recycles damaged immune cells and triggers stem cell-based regeneration of new immune system cells.[17] For those suffering from serious bacterial infections, GG not only boosts the body’s immune response, but it also weakens bacteria which thrive on glucose but suffer on ketones. Such weakened bacteria are much more susceptible to antibiotics and other traditional treatments.

GG helps with weight control, too. In order to lose weight permanently, in a healthy manner, activating GG is a prerequisite as only it can release stored fat for use as energy.



Balancing insulin and glucagon is the key, as experienced by the three ladies who adopted an IFL (each losing about 1 kg per month). “Eating less and exercising more” is not the answer; it just leads to frustration and failure - a “cruel hoax” as one medical doctor called it.[18] Activating GG is the solution. Actually, an enzyme called Hormone-Sensitive Lipase (HSL) inside the adipose cells is a main actor. It releases free fatty acids from triglycerides stored in the fat tissues. But, HSL only releases the stored energy from fats when insulin levels are low and GG is active, i.e., only when HSL cannot sense that insulin is elevated. Chronically-elevated insulin levels inhibit HSL, leaving those who want to lose weight feeling hungry, drained of energy, and seemingly gaining weight at the mere sight of food.[19] Why? Because in an insulin-resistant state, food and energy reserves (glycogen and triglycerides) cannot be tapped in a normal manner. In the abnormal state of insulin resistance, the liver transforms dietary carbohydrates into fat in a process called de novo lipogenesis.[20] While a healthy person with normal insulin function can metabolize carbohydrates for energy, the insulin-resistant person, eating the same amounts and kinds of food, will more likely than not convert such food into fat.[21] Therefore, the first step in losing weight is to restore hormone balance and GG signaling. The greater the degree of insulin disease (fatty liver, insulin resistance, metabolic syndrome, inflammation, suppression of glucagon, etc.), the greater the need to control insulin, both its concentration in the blood and the length of time it is elevated. As with obesity and every other chronic disease, there are well-documented pathways explaining why hyperinsulinemia is the single most important factor driving metabolic dysfunction, no matter where the dysfunction ultimately manifests itself. The litany of chronic diseases are just symptoms and side-effects of chronically-elevated insulin levels.[22] See Figure 8, above, showing multiple areas of the body affected by insulin signaling.

GG is very effective in restoring liver function. Fatty liver is now recognized as an independent risk factor for diabetic pathology and cardiovascular disease.[23] As the adipose tissues fill up with fat (principally from de novo lipogenesis, the process of fatty acid and triglyceride synthesis mainly from excess carbohydrates as mentioned above), the fat cells end up sending the fat back to the liver, inundating it with fatty deposits. As the liver fills with fat, this excess fat engulfs the heart, kidneys, pancreas, etc., and also accumulates as inflammatory visceral fat, causing multiple metabolic dysfunctions throughout the body.[24] Experts estimate that in the United States greater than 30-40% of the general population have NAFLD and for those who are overweight or suffer from diabetes Type 2, the percentages of those with fatty liver are even higher: 60% for overweight individuals and 70-90% for diabetics. Research shows that it is the liver’s inability to respond to insulin (insulin-resistance and NAFLD being one and the same) which causes elevated glucose levels in the blood, much the same way as a false negative feedback loop activates HSL in adipose tissues to free fatty acids while the liver sends triglycerides back to the fat cells in a never-ending cycle of “hot potato” lipoproteins (See Figure 9 highlighted in the 3<sup>rd</sup> segment of this author’s 12-hour, 2014 video). The greater the metabolic dysfunction, the harder and longer GG must work to restore health. In other words, the

time in between meals, along with other factors promoting an IFL, must be long enough to keep GG active, forcing the body to increase the use of ketones for energy. Some medical experts, such as Virta Health, have promoted “nutritional ketosis” to extend the time and level of ketones in the body.<sup>i</sup> They promote “ketogenic” meals which hardly elevate insulin at all and put patients into “nutritional ketosis” to extend the time and level of ketones in the body ... successfully reversing Type 2 diabetes, fatty liver, and metabolic syndrome. Some may view their dietary recommendations as extreme, but they argue that such measures are effective and healthy. They have proven that even Type 2 diabetics on insulin can do away with their medications. While running on ketones and extending the time that GG is active is one hallmark of an “insulin-friendly” lifestyle, especially for those already suffering from metabolic dysfunction, an IFL is unique in that it promotes a balanced diet and takes into account every daily activity which impacts insulin and activates GG in an effort to restore metabolic health and reverse fatty liver deposits and visceral fat. Is “nutritional ketosis” sustainable? Will it shorten one’s lifespan? Only time will tell. An IFL, on the other hand, offers a variety of balanced foods, beverages, exercises, and stress management techniques and is designed to last a lifetime using a multi-factorial approach focusing on controlling insulin and activating GG.

As with any lifestyle, the question of willpower and self-discipline must be addressed. Generally, resolutions to start a healthy lifestyle fail sooner than later. But, following an IFL can help. When every cell in the body is functioning normally and the mitochondria are supplying energy at optimal levels, sweets and junk foods lose much of their appeal and the body naturally chooses a healthy lifestyle. The senses seek optimal nutrition and the body wants to move and exercise. The microbiome, supported by probiotic foods and absence of refined products, also plays a part – a huge part really as some refer to the gut as the “first” brain. As a practical matter, without a healthy gut, willpower and self-discipline are severely tested, if not absent all together. It is the natural balance between insulin and GG which causes one to follow a healthy lifestyle and which can offer a new lease on life. The “yo-yo effect” of losing weight and gaining it back again stops. GG maintains normal organ function, energy levels, etc. GG, in many ways, is a “medical miracle” which can restore vitality and stamina, not only by slowing down the aging process, but even reversing it.

As miraculous as GG is, it needs time to restore health. Feeling younger and restoring the brain, heart, liver, kidneys, etc., is a slow process. Nothing happens instantly. Some functions improve within months, but the full power of GG can take years. It works slowly and naturally at the body’s own pace. GG must help the body to adapt and restore metabolic function. This involves epigenetics by restoring such diverse functions as, for example, FOXO3a’s DNA repair capabilities and restoring the insulin-producing Beta cells in the pancreas in diabetic Type 2 individuals. Only GG can reverse the “environmental factors” which led to Beta cell abnormalities and restore proper gene expression and signaling allowing the pancreas to start producing insulin again. GG acts throughout the body to restore autophagy, transcription factors, signaling pathways and cell receptors

involving mTOR, leptin and other hormones, glucose, uric acid production, etc.

Learning the basics of an IFL takes time, experimentation, and evaluating medical opinions from doctors, researchers, and professors. Some of this journey involves combining different foods and beverages, learning how plants and animals are raised and what they are fed, paying attention to how foods are prepared and even the order in which one eats such foods. The goal is to maintain full nutrition and maximize the time that GG is active. Exercise routines play a vital role, not to lose weight per se, but at least to preserve, if not increase, lean muscle mass, lower insulin levels, improve insulin sensitivity, and maximize GG. Finally, managing stress is vital for health, although sadly for most, this is easier said than done. Stress has an enormous impact on insulin as it interacts with hormones like cortisol (the so-called “fight or flight” hormone). Many daily activities and interaction with the modern age impact insulin more than most would believe. Going without sleep, high EMF and blue light levels, gum disease and chronic inflammatory root canals, heavy metals, family and work issues, etc., all affect insulin levels. Focusing on insulin levels as part of an overall “insulin-friendly” lifestyle will have benefits that can last a lifetime.

### Society and the Health Crisis

As this continuation study has shown, following an IFL can promote wellness, reduce metabolic dysfunction, and prevent chronic diseases. It can help control weight, restore liver function, and keep the cardiovascular system healthy. But, what can be done for the current worldwide health and obesity crisis? Extrapolating the individual results noted above, it may well be that nations adopting an IFL could take a giant step forward in the prevention of chronic diseases within their populations. Testing for hyperinsulinemia could virtually eliminate metabolic dysfunction and insulin disease in all its forms including visceral fat, insulin resistance, fatty liver, metabolic syndrome, inflammation, etc. Singling out and preventing insulin disease as the focus of national policy would have wide-ranging benefits. It could prevent all of the chronic diseases such as diabetes Type 2, hypertension, heart disease, cancer, obesity, Alzheimer’s, PCOS, etc. Moreover, an IFL could help those already suffering from such illnesses by offering lifestyle changes and treatment strategies to improve the quality of life for all concerned (patients and caregivers alike). In many cases, as the doctors at Virta Health (above) have shown, metabolic diseases themselves can be cured, including Type 2 diabetes. Medical doctors and researchers across the globe have found that lowering insulin levels can cure diabetes Type 2 and restore pancreatic function, even for those patients on daily insulin injections. They submit that “chasing” rising glucose levels with medications has been a serious mistake. They do not accept the official characterization that diabetes Type 2 is a “progressive, chronic, and incurable disease” caused by a lack of insulin (as defined by the American Diabetes Association). On the contrary, they believe it is a curable disease which can be reversed by lifestyle changes which allows the pancreas to produce less insulin, and not chronically-elevated insulin

levels which caused insulin resistance, fatty liver, diabetic pathology, and pancreatic dysfunction in the first place.

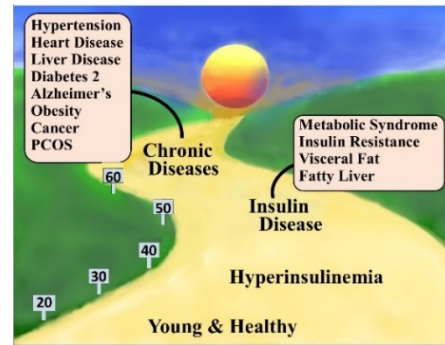


Fig. 10. In Time - Hyperinsulinemia to Insulin Disease to Chronic Diseases

Targeting hyperinsulinemia can reduce health care costs, too, by identifying those at risk of metabolic dysfunction at the earliest possible time. Many criticize the current medical system as merely managing chronic diseases with a “sick care” menu of procedures and medications. Managing chronic diseases not only fails to address the root cause, namely hyperinsulinemia and insulin disease, but also fails to detect a condition which could have been caught years, if not decades, earlier by simple diagnostic tests. Benjamin Franklin said it best, “An ounce of prevention is worth a pound of cure.” Detecting insulin disease and preventing inflammation and cardiovascular damage long before such conditions manifest themselves as hypertension, heart disease, diabetes Type 2, obesity, PCOS, cancer, etc., is the prudent approach. Hyperinsulinemia as a marker is the perfect “early warning system” since it flashes on the “radar” screen long before other conditions appear. This gives patients and health practitioners a window of opportunity to adjust lifestyle factors, especially if national policy encourages healthy lifestyle habits with incentives such as special hospital privileges, tax incentives, etc.

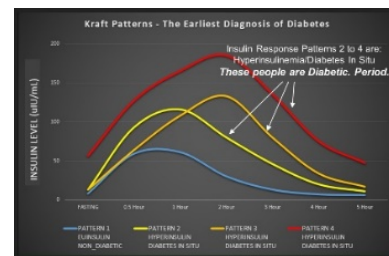


Fig. 11. Kraft Insulin Patterns

Fortunately, there are a number of protocols for detecting hyperinsulinemia. One was developed years ago by Dr. Joseph R. Kraft, M.D. In a procedure called the “insulin assay,” he tested insulin levels in over 14,000 patients. He recognized patterns which could detect abnormal insulin levels and “diabetic pathology.” He found that over 75% of those tested suffered from metabolic dysfunction even though many had normal fasting glucose levels or oral glucose tolerance tests (OGTT) results.[26] Dr. Kraft believed that diabetic pathology was the cause of heart disease. He once said, “Those with cardiovascular disease not identified with diabetes ... are simply undiagnosed.” This is a very profound observation.

While some question the wisdom of putting so much weight on an insulin test, given its pulsed oscillatory concentrations in the blood, there are others who claim that Dr. Kraft's insulin assay is the "most important health test" one can take, matching engineering precision. Future studies would be helpful to improve insulin testing protocols. Currently, taking five blood samples, as the Kraft assay involves, is problematic. Some experts have suggested that taking only two samples might be enough (the 2nd and 3rd hours after an oral glucose challenge). Also, many people, including this author, prefer not to take "pure glucose" and instead test glucose and insulin levels following a typical IFL meal. Future tests might include taking a standardized IFL food challenge (such as a universally-recognized food plate, healthy bar, or dried fruit) which could serve the same function. For now, the insulin assay combined with other routine tests such as HDL, CRP, HbA1c, triglycerides, BMI, waist-to-height ratio, CAC score, sdLDL, abdominal ultrasound, liver enzymes, etc., and relevant ratios such as TG/HDL can do much to assess metabolic risks and form the basis of effective prevention strategies. As more data is assembled, it may be that the TG/HDL ratio, currently regarded as a risk marker for CVD and sdLDL particle levels, will correlate as well as a useful marker for insulin levels. Instituting routine testing, at the earliest possible age, would benefit everyone. Someday, it may be possible to use a non-invasive monitoring device to measure insulin levels similar to those under development for measuring glucose. Maybe glucagon and all the other blood markers noted above could be available, too. Hourly measurements, averaged over time, of insulin levels would allow real-time data of what activities are elevating insulin, suppressing glucagon, and inhibiting GG. Insulin is a veritable "Rosetta Stone" for interpreting the body's metabolic signals and a virtual crystal ball to help prevent hyperinsulinemia and all the diseases which eventually follow.

## V. CONCLUSION

On an individual level, adopting an IFL promotes wellness and prevents metabolic dysfunction. On a national level, encouraging the population to follow an IFL may help solve the current health crisis. Focusing on insulin goes to the heart of what is a healthy lifestyle. Moreover, insulin levels are objective and politically neutral. Arguments over what foods or beverages to consume and in what ratios become moot. Faced with actual insulin test results, the definition of what is healthy becomes self-evident. Consumers faced with all manner of cookies, cakes, hamburgers, fried chicken, potato chips, instant noodles, ice cream, soda drinks and fruit juices made with added high fructose corn syrup, etc., would benefit by asking themselves a simple question, such as, are such foods insulin "friendly" or not? Educational programs, labels, consultations with health care professionals, etc., can help, too. When all is said and done, each person's insulin levels depend upon age, gender, health status, living conditions, environment, financial situation, etc. Focusing on insulin would be a step forward in building consensus and mitigating the confusing litany of diets championed by so many groups, often at odds with one another, including Low Carb High Fat, New Atkins, Plant-Based, Raw, Paleo, Primal, Ketogenic, DASH, Mediterranean, Traditional, Vegan, USDA

Dietary Guidelines, etc. All of these diets share much in common, notably advocating whole foods as opposed to processed products. Such commonality is, unfortunately, lost by the vast majority of consumers who tend to just give up trying to figure out what is best for their health, eventually just following sophisticated marketing by the food and advertising industries. Given the diversity of cultures and vast differences in dietary choices, focusing on insulin may be the most useful common denominator. By focusing on insulin and an IFL, along with an understanding of the GG effect, individuals and nations alike can find common ground and join forces to tackle the personal and worldwide health crisis.

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# **Session of Nursing**



# Effectiveness of smoking cessation program applying the transtheoretical model among students of Siam University

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## Abstract

**Purpose** – The purpose of this study is to examine effectiveness of smoking cessation program applying the transtheoretical model among students of Siam University. **Design/methodology/approach**- The one group pretest-posttest quasi experimental study was conducted among students of Siam University in January- February 2018. A total of 80 male undergraduate students participated in the study. 40 smokers male students were an experimental group and 40 of non smokers male were controls. The experimental group was participated in a smoking cessation program according to their stage readiness toward changing behaviors. They met for the transtheoretical model for group discussion and cessation counseling for 2 days. A self-administered questionnaire was used to collect data. Compare differences between mean scores before and after the experimentation by paired t-test. **Findings** – All of 80 student participants were male. At 4<sup>th</sup> week after receiving the transtheoretical model for group counseling, the experimental group had a significantly higher mean score for decision balance, self-efficacy, and smoking cessation behaviors than before the experimental ( $p < 0.05$ ). **Originality/value** – These study results especially smoking behavior before experimentation and the abnormal electrocardiogram of smokers re-emphasized the rising public health concern of tobacco use among younger boys. Therefore, if one can prevent or restrain adolescent from undesirable behaviors, this would contribute a great deal to the public health and society.

**Keywords:** Smoking, Cessation program, Siam University

## I. INTRODUCTION

Smoking is one of the leading causes of morbidity and mortality in the United States [1]. It is estimated that the total number of deaths from these two causes will be 1.6 billion in 2025. The number of smokers will increase in Third World countries from 4.5 billion to 7.1 billion by 2025 [2]. The World Health Organization reports that tobacco products kill their users. Tobacco kills nearly 6 million people each year. More than 5 million of these deaths are the result of direct tobacco use while more than 600,000 are the result of non-smokers being exposed to second-hand smoke. Unless urgent action is taken, the annual death toll could rise to more than 8 million by 2030.

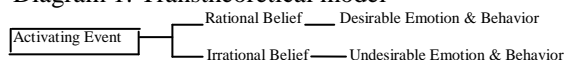
Also, secondhand smoke is detrimental to children's lungs and causes a greater probability of heart disease in adult nonsmokers [3]. Both active and passive smoking are associated with an increased risk of coronary heart disease [4-5] and cancer. Tobacco use starts at a young age, and the majority of adult smokers started using tobacco in their adolescence. When adolescent experimentation with tobacco becomes regular, it usually turns into a strong addiction, making it harder to quit later in life [6]. The Global School-based Student Health Survey (2016) reported that 29.4 percent of students aged 13–17 years old were current users of tobacco [7]. The Global Youth Tobacco Survey (2009) of Thailand showed that 20.7 percent of adolescents smoked tobacco. A recent survey in Thailand showed that the trend of tobacco use among Thai youth has decreased substantially from 19.9% (2015) to 7.8 % (2017) [8].

Tobacco use among adolescents had been associated with socio-demographic factors, including age, gender, residence, tobacco use by parents, siblings and peers [9–10]. Studies have

found associations between smoking and an adolescent's personality and self-esteem. Studies of motivational smoking cessation programs [11] found that program should be investigated and for the further research needs the evidence of intervention to stop smoking, for the effect of cognitive intervention on tobacco smoking among adolescent [12] found that cognitive intervention program incorporated anti-smoking beliefs, and find it easier to stop smoking. In Thailand, there also were some studies on tobacco use among adolescents.

This study explored adolescents' cognitive and behavioral responses to the transtheoretical model of Corey (2012) (Diagram 1) that impact adolescents' smoking and how these responses depend on transtheoretical model implementation (change from irrational belief to rational belief).

Diagram 1: Transtheoretical model



## II. METHODS

### Study design and participants

The one group pretest-posttest quasi experimental study was conducted among students of Siam University. The data on tobacco use among students and their characteristics were obtained in January- February 2018. The sample was selected with inclusion criteria of the following: being willing to participate this study, 17-25 years old, and being healthy. The exclusion criteria were active illness during study, and, drug abuse and cannot complete in whole study. A total of 80 undergraduate students participated in the study. 40 smokers

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male students (follow inclusion criteria) were using a purposive simple random sampling and were an experimental group and 40 of non smokers male were controls. The experimental group participated in a smoking cessation program according to their stage of readiness towards changing behaviors. They met the transtheoretical model (rational emotive behavior therapy) (Diagram 1), for group discussion and cessation counseling for 2 days. A self-administered questionnaire was used to collect data. SPSS version 17 was used for data analysis. Descriptive statistics were used to describe the participant's demographic characteristics and their tobacco use behavior. Differences between mean scores before and after the experimented were investigated using paired t-test, where a p-value of 0.05 was considered statistically significant.

### III. RESULTS

#### Demographic information

The characteristics of the participants both smokers and nonsmokers were shown in Table 1. There were 80 students who took part in the study. All of them, 80 were male undergraduate students. Their ages ranged from 17 to 22 years with the majority of them  $\geq 21$  years (45% of smoking and 40% of nonsmoking). Almost smokers used tobacco among their friends (75%). Most of the students described themselves as extroverts. Smoking behaviors

The distribution of smokers according to the quantity of cigarettes they smoke is shown in figure 1. 47.5% of the participant (n=40) smoked 1-5 cigarettes per day. 12.5% smoked 6-10 cigarettes per day. 15% smoked 11-15 cigarettes per day. 20% smoked 16-20 cigarettes per day and 5% smoked more than 20 cigarettes per day (Figure 1).

#### Factors in Smoking Cessation

The participants were asked "what would help you to quit smoking". All 40 smokers choose one or more of the answers. 32.5% said that a change in habits helped participants to quit smoking. 25% said Self-motivation and 20.0% said exercise (Table 2). Individual counseling, hypnosis and gum did not work for the participants (2.5%) (Table 2). For the comparison of the smoking behavior and dysrationalia of smoking participants who smoked at 4<sup>th</sup> week before and after receiving the transtheoretical found that after receiving the transtheoretical model had a significantly lower mean score for the smoking behaviors ( $3.2 \pm 0.59$ ,  $2.89 \pm 0.50$ ) at  $p < 0.05$  and significantly lower mean score for the dysrationalia of smoking ( $2.90 \pm 0.60$ ,  $2.46 \pm 0.36$ ) at  $p < 0.01$  respectively than before the experimental (Table 3).

This study also has checked for the electrocardiogram (EKG) of smokers and nonsmokers. An abnormal EKG of smokers result shown in Figure 2 which may risk of cardiovascular disease than nonsmokers (Figure 2).

### IV. DISCUSSION

The majority age of study participants were 20-22 years, male, and had never been married; most (47.5%) smoked 1-

5 cigarettes per day. These results support the articles by Solberg et al. [13] and Green et al. [14] in which the majority of college-aged students do not smoke. The majority of the participants who did smoke had succeeded in smoking cessation but then started smoking again and most of the participants had tried to quit smoking multiple times. Also, the top two reasons for wanting to quit were health and money. Most of the participants in this study indicated that they believe they will quit smoking. This finding was different from Steinberg et al. [15] who indicated that half of their high school population believed they would still be smoking in the future. The sample revealed that change in habits; self-motivation, and exercise were the methods selected most frequently to be effective in smoking cessation. The participants also indicated that they would change their personal habits and exercise routine in order to become tobacco free. These findings are useful in developing a smoking cessation program and need to be further explored to identify specific interventions that are effective in smoking cessation. Furthermore, the participants indicated that most of the answer choices concerning what to include in a smoking cessation program were important or very important. This indicates that a comprehensive approach that includes physical, psychosocial and medicinal elements is needed in a smoking cessation program for the college age population. Staten & Ridner [16] also found that college age students (18-24 years old) need a comprehensive smoking cessation program. Sussman et al. [17] found that including social influence, cognitive behavioral approach, motivation and medical in their smoking cessation programs proved to be effective in teenagers. This comprehensive approach in this study is similar to the results found in other than the age difference [17]. Bauld et al. [18] found that group therapy and medication were effective in smoking cessation programs. Schreuders et al. [19]

Cigarette smoking is established as a major risk factor for coronary heart disease. The effect is caused by various factors such as sympathetic activation and inflammation [20,21]. Similarly of this study showed 38/40 (95%) of smokers had an abnormal EKG that may be a higher risk of cardiovascular disease than nonsmokers.

### V. CONCLUSION

Change in habits, self-motivation and exercise were the top three answers for the most effective way to quit smoking. The most effective smoking cessation program in this study were the transtheoretical model (rational emotive behavior therapy, the support results from table II intervention of change habit and self motivation aid in smoking cessation with 32.5% and 25%, respectively.) for the college-age smokers for this population wanting to quit. It is important to: educate adolescent smokers about the harmful effects of smoking; educate younger populations that are at risk for smoking; and educate students from healthcare professions on how to best help their patients make the choice to quit smoking.

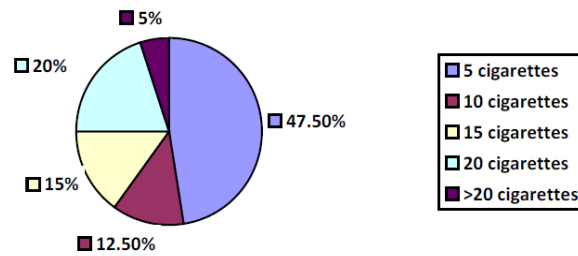


Fig. 1: Distribution of smokers according to the quantity of cigarettes smoked for the whole period of smoking (units in % number of cigarette smoked per day and  $n=40$ )

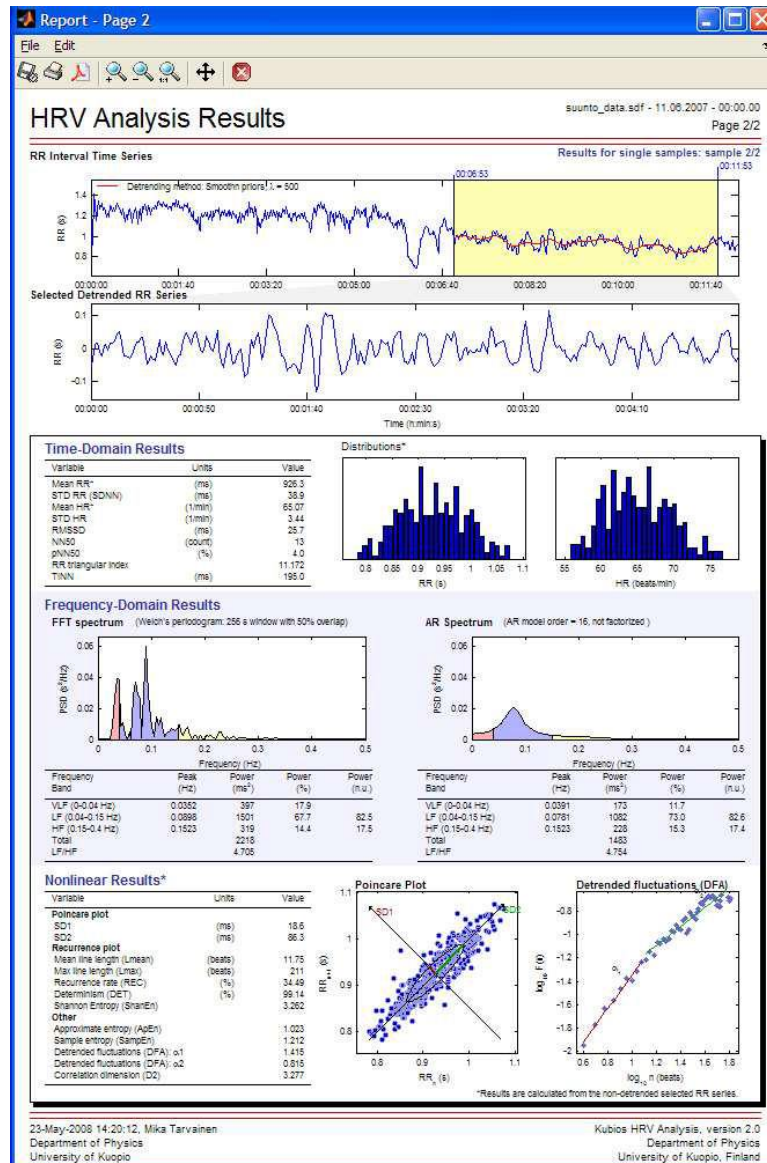


Fig. 2: The abnormal electrocardiogram of smokers

TABLE I. DESCRIPTIVE DATA AND CHARACTERISTICS OF THE STUDY SAMPLE IN RELATION TO SMOKING

PARAMETER	SMOKERS n (%)	NONSMOKERS n (%)	P-VALUE
Age (year)	$\bar{X}$ = 19.85 years	$\bar{X}$ = 19.70 years	
17	2/40 (5)	2/40 (5)	NS
18	4/40 (10)	6/40 (15)	NS
19	10/40 (25)	10/40 (25)	NS
20	6/40 (15)	6/40 (15)	NS
≥ 21	18/40 (45)	16/40 (40)	NS
Gender			
Male	40/40 (100)	40/40 (100)	NS
female	-	-	
Academic year classification			
1	2/40 (5)	2/40 (5)	NS
2	4/40 (10)	6/40 (15)	NS
3	16/40 (40)	16/40 (40)	NS
4	18/40 (45)	16/40 (40)	NS
Start smoking (year)			
10	2/40 (5)	-	-
13	10/40 (25)	-	-
14	10/40 (25)	-	-
15	18/40 (45)	-	-
Marital status			
Single	40/40 (100)	40/40 (100)	NS
Married	-	-	
Need to give up smoking	40/40 (100)	-	-

TABLE II. INTERVENTIONS THAT AID IN SMOKING CESSATION (N=40)

INTERVENTIONS	N(%)
Hypnosis	1/40 (2.5)
Individual Counseling	1/40 (2.5)
Gum	1/40 (2.5)
Don't Know	2/40 (5)
Medicine	4/40 (10)
Exercise	8/40 (20)
Self-Motivation	10/40 (25)
Change Habits	13/40 (32.5)

TABLE III. THE COMPARISON OF SMOKING BEHAVIORS THE DYSRATIONALIA OF SMOKING BEFORE AND AFTER RECEIVING THE TRANSTHEORETICAL MODEL

PROGRAM	MEAN SCORE OF SMOKING BEHAVIORS						MEAN SCORE OF DYSRATIONALIA OF SMOKING				
	n	M	SD	df	t	p	M	SD	df	t	p
Before	40	3.20	0.59	39	-2.30*	0.03	2.90	0.60	39	2.96**	<0.01
After	40	2.89	0.50				2.46	0.36			

\*p&lt;0.05

\*\*p&lt;0.01

## V. CONCLUSION

Change in habits, self-motivation and exercise were the top three answers for the most effective way to quit smoking. The most effective smoking cessation program in this study were the transtheoretical model (rational emotive behavior therapy, the support results from table II intervention of change habit and self motivation aid in smoking cessation with 32.5% and 25%, respectively.) for the college-age smokers for this population wanting to quit. It is important to: educate adolescent smokers about the harmful effects of smoking; educate younger populations that are at risk for smoking; and educate students from healthcare professions on how to best help their patients make the choice to quit smoking.

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# Caring behavior of caregivers of elderly at Baan Bangkae social welfare development center

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## Abstract

**Background:** To study the self-care behaviors of elderly caregivers at Baan-Bangkae Welfare Development Center for older persons, Bangkok. **Methodology:** Descriptive research was conducted among thirty two elderly caregivers by purposive sampling technique. Data were collected using the questionnaires that constructed by the researcher during May- June 2016. Data were analyzed using basic statistic and stepwise multiple regression.

**Findings:** The caregivers' knowledge of self-care, belief in self-efficacy, caregivers role acceptance, social support and caregivers' self caring behaviors of elderly persons score were as being in a moderate level. The respondents in perimeter which were different in sex age would be statistically difference at 0.05 in self-care behavior. Supportive factors for self-care behavior, sex, age, marital status, educational level, occupation and family's monthly income, caregivers' knowledge of self-care, caregivers role acceptance and social support predicted the caregivers' self-care behaviors at 35% with statistically significant at 0.05.

**Conclusion:** These study results emphasized the rising public health of elderly. The goal was to reduce burden and depression and increase self-care by providing participants with information and tools to assist in their role as caregivers. Further research is needed to clearly understand the needs and determine effective interventions for our rapidly aging population and diminishing number of caregivers. Nurses are in a pivotal position to implement and evaluate evidence-based interventions for elderly or other dementias.

**Key words:** caregivers' self-care behavior, predictors of caregivers' self-care behavior, elderly caregivers

## I. INTRODUCTION

According to United Nations, Thailand entered into the period of "the ageing society" in 2005 [1]. The number of elderly persons in Thailand is expected to rise significantly over the next 25 years. An important issue for Thailand is the very high pace of growth of its ageing population. In order to prepare our society for this increase in elderly population, the Ministry of Public Health and the Ministry of Social Development and Human Security had submitted a proposal on "Development of a Community Based Integrated Health Care and Social Welfare Services Model for the Elderly" Caregivers in Thailand are increasing rapidly they are especially required to care for elderly people and elderly people with dementias. A lack of training and support puts them at risk of depression, anxiety, and failure to take care of their own healthcare needs [2]. Caregivers in Thailand are predominantly women. They provide 75-80% of long-term care and face many challenges that create both physical and psychological stress. This is due to that fact that they are increasing expected to provide more demanding and complex care including medication management [3]. Self care behaviors are defined as activities of self care which consist of individual self care, family care or community self help group. D. Orem's paper presents his theoretical constructs (TCs) of self-care and reviews the literature concerning knowledge of medication self-care requisites, social learning and self-care, deliberate action as self-care behavior, and design of nursing systems for monitoring self-care.

Care giving often seriously reduces the quality of life of caregivers, creating severe physical, psychological, emotional, social, and financial problems [4]. Care giving may also

increase early mortality among caregivers [5]. The caregiver burden is associated with the poor outcomes of elderly with and without dementia patients [6-7]. Only a few researchers have studied the burden of dementia on caregivers in Thailand [8-10]. They found that there is a risk of physical and psychological disorders among caregivers of those with older or other dementias, indicated by depression, anxiety, and reported burden in caused by lack of time for self-care, inadequate supportive services, burden of providing care and lack of respite services to relieve caregivers of their duties [11-12]. The primary aims of this study were to study the level of self-care behavior, knowledge of self-care, belief in self-efficacy, caregivers role acceptance, social support and caregivers' self caring behaviors of elderly caregivers and determine these parameters as predictors of caregivers self-care behaviors. It then aims to compare the caregivers' self-care behavior as classified by sex, age, marital status, educational level, occupation and family's monthly income.

Caregivers are the key to successful elderly or dementia care. This is especially the case where, caregivers- are adult family members or of government public welfare caregivers who provide uncompensated care are essential in caring for older adults with disabilities or dementia. The research of caregivers and behavior problems of care receivers sought to identify those caregivers who are most susceptible to fluctuations around causative factors: increased task; increased problematic behaviors; and increased family discord [13]. Age and gender of the caregiver along with behavior problems of care receivers were found to be predictive of care giver depression [14]. The relationship between a caregiver's stress and functional ability as they related to self-care behaviors

responding to physical and psychological symptoms was studied by Lu and Wykle [15]. They found that caregivers who reported poorer self-health also reported higher levels of caregiving stress.

In this study the level of self-care behavior (SC), knowledge of self-care (KN), belief in self-efficacy (SEF), caregivers role acceptance (CRA), social support (SS) and caregivers' self caring behaviors of elderly caregivers was explored.

## II. METHODS

**Study design and participants** The subject: This study was a-cross-sectional research consisting of data collection from thirty two elderly caregivers at Baan-Bangkae Welfare Development Center for older persons, Bangkok. The respondents were selected using the purposive sampling technique. Data was collected between May and June 2016. The research instrument was the self-administered questionnaire which conducted of 6 parts. These were; 1) Personal information: age, education level, maternal status, economic status, current gender. 2) Knowledge on self-care form: this was developed by the researcher and it consisted of 10 items that elicited a true or false response. Positive questions scored 1 for true option and negative questions scored 2 for false. 3) Perceived self-efficacy form: it consisted of 10 items using 5- point Linkert scale from 0 (not at all) to 4 (highly confident). 4) Caregivers role acceptance of elderly: it is consisted of 10 items using 5- point Linkert scale from 0 (lowly accepted) to 4 (highly accepted). 5) Perceived social support: 10 items were conducted from the social support concept using 5- point Linkert scale to measure levels with social supports received from significant persons. The scale was from 0 (lowly supported) to 4 (highly supported). 6) Self-care behaviors for elderly persons from: it was used a self-care behaviors of elderly caregivers by researcher. The questionnaires had negative and positive items. The negative items scored from 0 (never) to 4 (always). This questionnaire was reviewed by 3 experts for content validity. 30 caregivers who had the same characteristics with target population were included in pilot study to reliability test of this questionnaire. All parts has internal consistency reliability Cronbach alpha coefficient equal to 0.870 or more.

### Statistical Analysis

Data analysis was performed using the Statistical Package for the Social Science (SPSS) Version 17.0 for Windows. Descriptive statistics were frequency, percentage, mean and standard deviation. The correlation between independent and dependent variables was analyzed using Pearson's product moment correlation coefficient. Stepwise multiple regression analysis was applied in finding the factors correlating and predicting the self-care behaviors. The significance level was set to  $<0.05$ .

## III. RESULTS

All of the 32 caregivers who were working at Baan-Bangkae Welfare Development Center for older persons approached in the study, 100% returned complete questionnaires. The mean (SD) age of caregivers was 49.5 (10.0) years. 22 (68.7%) were women. 37.5% were married.

81.2% of the caregivers had an educational levels of high school or diploma level education, while 18.8% had educational levels of bachelor degree and above. 65.6% were part time employee and 46.9% had an income of 10,000-14,999 Baht/month. 25 caregivers (78.1%) reported that they did not have health problems.

The older persons that were cared for by the respondents were likely to have moderate to severe illness, as indicated by the need for assistance in basic activities of living and suffering from dementia more than 5 years (Table I).

Regarding the caregivers, 65.6% had a moderate level of knowledge, participants had a moderate level of belief in self-efficacy, caregiver role acceptance, social support and self-care behavior of caregivers (71.9%, 75%, 65.6% and 75%) respectively, (Table II).

Through the calculation of Pearson's product moment correlation coefficient it was shown that knowledge of caregivers' self-care (KN), social support (SS), belief in self-efficacy (SEF), and caregiver role acceptance (CRA), were correlated with self-care (SC) behaviors: 0.574, 0.497 ( $p<0.01$ ), 0.143 and 0.167 ( $p<0.05$ ) respectively, (Table III).

## IV. DISCUSSION

### Caregiver Demographic Variables

The following characteristics of caregivers are discussed in this section: (a) age, (b) female gender, (c) spouse status, (d) education, and (e) financial status. These variables were believed to be associated with self-care behavior for caregivers.

**Age:** In this study a mean age of 49.5 years (ranging from 26 to 59) was found. Results indicated that age was not related to self-care behavior. Very few studies exist in the literature about the effects of caregiving on caregiver self-care behavior. Unfortunately, findings of the only two known studies appear to be inconsistent. One study by Sisk (2000) [18] found that the increase in caregiver age was associated with a decrease in exercise, while another study [19] indicated that increased age was associated with better practice of health behaviors including exercise. One possible reason for this inconsistency in findings may be that advanced age combined with another latent factor such as poor general health are barriers to caregiver exercise. Poor health was projected to contribute to increased burden [20]. Both studies [18-19], however, did not examine caregiver health status. Therefore, it is unknown whether general health was a factor that contributed to differences in the findings of both studies. In this study, good and excellent health was reported by 78.1% of participants; the increase in age was not associated with decreased general health or increased burden. The findings indicate that poor health is not an issue for respondents. This included caregivers with advanced age whose health was not significantly different from their younger counterparts. Similar with our result, another large sample, longitudinal study observed that older caregivers generally had better physical health compared to non-caregivers [21]. Better physical health was a prerequisite for older people taking on the role of caregiving in the first place. This supports our finding that age is not associated with general health.

**Female gender:** Caregiving is traditionally viewed as a role of women. Females accounted for over two-thirds

(68.7%) of study's sample. These consisted of wife caregivers (37.5%) and adult daughters (55%). with the remainder being mothers. Female gender in this study was associated with greater caregiving satisfaction and better performance in nutrition. These findings are not unexpected since female caregivers compared to male caregivers were more likely to commit to a caregiver role and view caregiving as part of their familial duties [22]. By contrast, male caregivers often experienced conflicts in their gender role due to their traditional beliefs of masculinity [23]. They were therefore, understandably, less likely to have feelings of meaning or satisfaction from caregiving than women. Similarly, planning and preparing foods were the traditional familial role of women. Given the cumulative experience in food preparation, it is conceivable that women were more knowledgeable in food selection and consumption for the sake of continued family health and well-being than the male caregivers. Previous studies indicated that female caregivers experienced greater burden and poorer emotional well-being than male caregivers [24]. Our findings agreed with this.

**Marital status:** 38% of participants were spouses; two-thirds were wives. Spouse status in this study was not significantly associated with co-residence and less caregiving mastery. No significant relationships were found between spouse status and self-care. This was consistent with previous studies [25]. Spouse status was also not associated with burden in this study. This further indicates that poor health may play an important role in other studies that observed a greater burden in spouse caregivers [24]. In other words, being a spouse as well as having poor health together may explain the escalated burden in spouse caregivers.

**Education:** 81.2% of the caregivers had educational levels of high school or diploma. Education is a well-known indicator of health and life expectancy in the general population. The general belief is that knowledge, skills and better life circumstances transferred through education contributed to better health [26]. This study, however, indicates that education was not significantly associated with self-care behavior.

**Financial status:** Similar to educational attainment, socioeconomic status was well-known to be associated with better life circumstances and access to medical care [27]. Older people with higher household income were found generally having better health and life expectancy than others whose socioeconomic status was low. Studies revealed that the disparity of socioeconomic status in health was also evident among caregivers. This was because health care accessibility mediated the adverse effects of caregiving on caregiver health [27]. Our study confirms these findings (not present in table). About two-thirds of our study subjects reported no financial strain, three-quarters had good or excellent health; financial status was positively associated with better caregiver health.

The predictors of Caregiver Self-Care behavior that were found were: (a) knowledge of caregivers' self-care, (b) perceived self-efficacy in self-care, (c) social support, and (d) self-care behaviors for caring elderly persons, when controlling for caregiver demographic variables.

This study found that caregivers who had higher knowledge of caregivers' self-care or who had higher

perceived self-efficacy in self-care or who had higher social support would have better self-care behaviors for caring elderly persons. For self-care knowledge in this sample group, there was mostly on a moderate level of knowledge. There was a significant correlation between the education level of participants and their self-care behavior for caring elderly persons. This result was similar to various recent studies [28-29]. This contrasts with the study of Lawton et al. (1989) [30] that did not find a significant correlation. Furthermore, the findings pointed that KN, SEF, CRA, SS and age were correlated with self-care (SC) behaviors of pregnant Thai adolescents. This can be illustrated that order for individuals to successfully practice behaviors, they need to have perceived self-efficacy to define their own ability to conduct and perform the behaviors until they complete their goal [31]. Perceived self-efficacy is a qualification of individuals who have the potential to take care of themselves, individuals who have knowledge, thinking ability, and skills to employ cognitive and intellectual processes to memorize and utilize knowledge in actual practices [32].

The majority of caregivers reported low denial but high positive reframing and acceptance. This indicated that intensively using emotional coping results in emotional dysfunction, leading to more distress and burden. This was not an issue for this group of caregivers who had a relatively high educational attainment [33]. In addition to this social supports and advice received from health care providers can reduce psychosocial problems of elderly caregivers. Furthermore, self-esteem makes individuals accept and believe in themselves. This makes them not only feel valuable but also influences positive self-care behaviors. In addition, in order for individuals to perform behaviors successfully, they ought to have perceive self-efficacy. As an outcome, CRA, KN, SEF and SS for elderly persons could predict the variation of self-care behaviors of caregivers. From the study finding that CRA, KN, SEF and SS were related to self-care behavior ( $r=0.759, 0.777, 0.790$  and  $0.803$ ;  $p<0.01$ ) respectively,. These findings were in line with Antonucci [34]. He demonstrated perceived social support has stronger predicting power for the effects of social support on adaptation than the measure of received social support. Despite this some studies [35-36] have argued that perceived social support is conceptually distinct from received social support.

**Lessons learned:** It would likely be more effective and more personal to those attending and would offer each member more opportunities for active participation and questions. For future practice and research will manage in a large group setting. It is focusing on community partnership to address caregiving among elderly people.. At the completion of 3-month program, caregivers will invite to join an ongoing support group scheduled. The next project goal is to create a model caring community and society for the elderly. To develop integrated community base health care and social welfare services resulting in sharing of resources, benefits and provision of holistic health and welfare services contributing to increase the quality of life for the elderly and sustainable healthy life style.



TABLE I. THE CHARACTERISTICS OF 32 CAREGIVERS PERSONAL FACTORS WITH SELF CARE BEHAVIOR

PARAMETER	n (%)
Age (year)	$\bar{X}$ (SD) = 49.5 (10.0) range (26-59)
25-34	9 (28.1)
35-44	5 (15.6)
45-54	15 (46.9)
$\geq 55$	3 (9.4)
Gender	
Male	10 (31.3)
Female	22 (68.7)
Marital status	
Single	6 (18.8)
Married	12 (37.5)
Widow	3 (9.4)
Others	11 (34.3)
Education	
High school/Diploma	26 (81.2)
Bachelor degree	3 (9.4)
Higher than Bachelor degree	3 (9.4)
Occupation	
Permanent employee	6 (18.8)
Part time employee	21 (65.6)
Government officer	5 (15.6)
Monthly income (Baht)	$\bar{X}$ (SD) = 15,271.56 (7,257.42)
<10,000	6 (18.7)
10,000-14,999	15 (46.9)
15,000-19,999	4 (12.5)
$\geq 20,000$	7 (21.9)
Health status	
Healthy	25 (78.1)
High risk	6 (18.8)
Ill	1 (3.1)
Illness	
Hypertension	1 (3.1)

TABLE II. THE MEAN, SD AND PERCENTAGE OF KNOWLEDGE, BELIEF IN SELF-EFFICACY, CAREGIVER ROLE ACCEPTANCE, SOCIAL SUPPORT AND SELF-CARE BEHAVIOR OF CAREGIVERS (N=32)

PARAMETER	n (%)	Mean (SD)
Levels of knowledge of caregivers' self-care (KN)		
Low (0-6 scores)	6(18.8)	7.375 (1.238)
Moderate (7-8 scores)	21(65.6)	
High (9-10 scores)	5(15.6)	
Levels of belief in self-efficacy (SEF)		
Low (0-32 scores)	4 (12.5)	36.87 (4.36)
Moderate (33-41 scores)	23 (71.9)	
High (42-50 scores)	5 (15.6)	
Levels of caregiver role acceptance (CRA)		
Low (0-32 scores)	5 (15.6)	38.87 (2.19)
Moderate (33-41 scores)	24 (75.0)	
High (42-50 scores)	3 (9.4)	
Levels of social support (SS)		
Low (0-32 scores)	5 (15.6)	41.4 (2.96)
Moderate (33-41 scores)	21(65.6)	
High (42-50 scores)	6(18.8)	
Levels of self-care (SC) behaviors		
Low (0-23 scores)	5 (15.6)	27.53 (3.59)
Moderate (24-31 scores)	24 (75.0)	
High (32-50 scores)	3 (9.4)	

TABLE III. PEARSON'S PRODUCT MOMENT CORRELATION COEFFICIENT (R) BETWEEN SELF-CARE KNOWLEDGE OF CAREGIVERS' SELF-CARE (KN), SELF-EFFICACY (SEF), CAREGIVER ROLE ACCEPTANCE (CRA), SOCIAL SUPPORT (SS) AND SELF-CARE BEHAVIORS (SC)

Variable	KN	SEF	CRA	SS	SC	Age	Income	Education
KN	1	-0.027	0.058	0.445**	0.574**	0.387*	0.378*	0.673**
SEF	-0.027	1	0.462**	-0.024	0.143*	0.145	0.260	-0.158*
CRA	0.058	0.462**	1	-0.024	0.167*	0.377*	0.070	-0.107*
SS	0.445**	-0.024	-0.024	1	0.497**	0.132	0.398*	0.393**
SC	0.574**	0.143*	0.167*	0.497**	1	-0.087	0.093	0.178**

\*p&lt;0.05

\*\*p&lt;0.01

## V. CONCLUSIONS

Perceived caregiver role acceptance, social support from close relatives and medical personnel and knowledge of caregiver self-care were predicted to caregivers' self-care behaviors for elderly and dementia persons in this study. However, the findings recommended that community health-care should providers promote self-care behaviors among this group by improving their knowledge of self-care. This should have enough detail to enable elderly caregivers to their community network. For improving their self efficacy, training should be provided in the form of

group discussion among caregivers to exchange attitude and to develop positive feeling towards themselves. The whole caregiver group are at risk for chronic illnesses. Self-care is determinant to their health promotion and disease prevention. Yet, of this group in the population, there is no common self-

care profile. They have no routine wellness or physical check-ups, they seldom take exercise, have little time for socializing and healthy eating, and have a severe lack of sleep or rest. This study expands on the existing understanding of the adverse effects of caregiving on caregiver health in the caregiver literature.

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# The effect of Nei-Guan Acupressure on reducing postoperative nausea and vomiting in patients after surgery

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## Abstract

Postoperative nausea and vomiting is defined as nausea and vomiting at the first 24 to 48 hours after surgery. Approximately about 20 to 30 % patients suffer from PONV. It can lead to wound laceration, esophageal rupture, aspiration pneumonia or dehydration. Nei-guan acupressure in Eastern medicine can reduce nausea and vomiting. So we want to know whether Nei-guan Acupressure can reduce postoperative nausea and vomiting or not. Methods: Databases were searched using PubMed(2012-2017), keywords include postoperative, patient after surgery, P6/ Nei-Guan acupressure, postoperative nausea and vomiting use Boolean Logic to search. Three papers are qualified. Result: 1. Using Nei-Guan acupressure from thirty minutes before surgery to 72 hours after surgery can reduce the symptoms of postoperative nausea and vomiting. 2. Clinical application, patient used Nei-Guan acupressure from thirty minutes before surgery to 72 hour after surgery, the Numerical Rating Scale (NRS) of nausea and vomiting was from 5 points(after surgery) to 0 points (8 hours after surgery). Conclusion: After Review the literature, it was proved that Nei-Guan acupressure can reduced postoperative nausea and vomiting. We often see patients have different severity of postoperative nausea and vomiting. Although antiemetic drug can relief this symptom, but the time is short. So we can use this evidence-based nursing on patients, teach patients use Nei-Guan acupressure to reduce postoperative nausea and vomiting.

**Keyword:** postoperative nausea and vomiting , Nei-Guan Acupressure , P6 Acupressure

## I. INTRODUCTION

Nowadays, many diseases can be cured or controlled by surgery. Some people experience severe nausea or vomiting after surgery which is caused by anesthesia. Postoperative nausea and vomiting (PONV) is defined as nausea and vomiting at the first 24 to 48 hours after surgery. Approximately 20 to 30 % patients suffer from PONV. It can lead to wound laceration, esophageal rupture, aspiration pneumonia or dehydration. Clinically, we saw many patients after surgery went through nausea and vomiting uncomfortably and can't be relieved after antiemetic drug. Nei-Guan acupressure in Eastern medicine can reduce nausea and vomiting. This project aims to find out how effective Nei-Guan Acupressure is at reducing postoperative nausea and vomiting.

## II. MATERIALS AND METHODS

Databases were searched using PubMed(2012-2017). The search terms use (postoperative or patient after surgery) and (P6 acupressure or Nei-Guan acupressure) and (postoperative nausea and vomiting), as shown in Table 1. The literature should under the criteria of human subjects, English-language publications, randomized clinical trial or systemic review.

## III. RESULTS AND DISCUSSION

Five articles were included, but only three randomized clinical trial met the inclusion criteria and were thoroughly read.

Table I. Search terms

Patient /population	Intervention	Outcomes	Type of Research
postoperative	P6 acupressure	Postoperative nausea and vomiting	Randomized control trial
patient after surgery	Nei-Guan acupressure		Systematic review

A. Use of a disposable acupressure device as part of a multimodal antiemetic strategy for reducing postoperative nausea and vomiting.

[1] White and et al.: One hundred patients who scheduled to undergo laparoscopic surgery under general anesthesia were randomly assigned to controlled group(n=50) or acupressure group(n=50). They both had wristband on their wrist from thirty minutes before surgery to seventy two hours after surgery. But acupressure group's wristband had a button

to stimulate Nei-Guan acupressure. The result showed that from zero to seventy-two hours after surgery, six patients (12%) in the experimental group experienced vomiting and fifteen patients (30%) in the control group experienced vomiting. The experimental group was significantly less than the control group ( $P=0.03$ ). (Level 2)<sup>1</sup>

#### B. The effect of acupressure on nausea and vomiting after cesarean section under spinal anesthesia

[2] Noroozinia and et al.: One hundred fifty two patients who underwent Caesarean section under spinal anesthesia were randomly assigned to whether controlled group ( $n=72$ ) or acupressure group ( $n=72$ ). They both had wristband on their wrist from thirty minutes before surgery. But acupressure group's wristband had a button to stimulate Nei-Guan acupressure. Nausea in the acupressure group was significantly less than the control group when patients during surgery, at first, second, and third 2 h after the surgery. Zero patients in the experimental group vomiting occurred, which was significantly less than eleven patients in the control group ( $P=0.002$ ). (Level 2)<sup>2</sup>

#### C. The efficacy of P6 acupressure with sea-band in reducing postoperative nausea and vomiting in patients undergoing craniotomy: a randomized, double-blinded, placebo-controlled study.

[3] Nilsson and et al.: Patients who underwent Craniotomy under general anesthesia were randomly assigned to either controlled group ( $n=52$ ) or acupressure group ( $n=43$ ). They both had wristband on their wrist from after surgery to 48 hours after surgery. But acupressure group's wristband had a button to stimulate Nei-Guan acupressure. The incidence of nausea and vomiting was no significant difference between the experimental group (72%) and the control group (64%) within 48 hours after surgery ( $P=0.372$ ). (Level 2)<sup>3</sup>

## IV. CONCLUSION

After reviewing the literature, it was proved that Nei-Guan acupressure can reduced postoperative nausea and vomiting. Clinically, we taught a patient to correctly locate Nei-Guan acupressure and use the wristband from thirty minutes before surgery to seventy-two hours after surgery. Patient said that the NRS of PONV was five points after surgery, two points six hours after surgery and 0 point eight hours after surgery. Finally, patient never vomit after surgery. Acupressure is a non-invasive and easy to use treatment. By this evidence-based nursing result, we can promote patients using Nei-Guan acupressure to reduce postoperative nausea and vomiting

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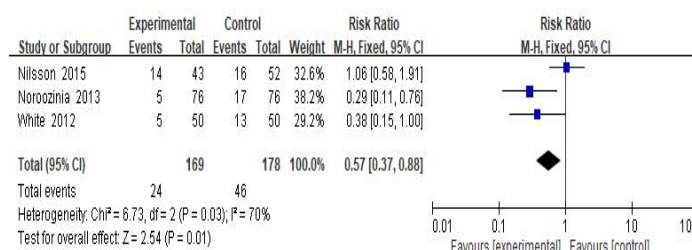


Fig. 1. Forest plot

#### D. Meta-analysis

It showed that Nei-Guan acupressure was effective for reduce postoperative vomiting.

# Exploring the home experiences of parents caregiving for children with medical complexity: A qualitative synthesis

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## Abstract

**Aims:** Caregiving for children with medical complexity (CMC) is an intensive and time-consuming responsibility. For this parents need to develop specific skills to reduce the burden of parenting. The aim of this research was to gain a better understanding of parents' perspectives on providing care to a child who is technology-dependent. A qualitative synthesis of collected studies was performed to aggregate the parents' perspectives on caregiving for their children.

**Method:** A systematic review and thematic synthesis of qualitative studies was carried out. Five electronic databases (Pub Med, Embase, Cochrane Library, Science Direct, and CINAHL) were searched for reports on parent's views about caring for their CMC. Article quality was assessed using the Critical Appraisal Skills Program (CASP). Thematic synthesis was used to examine and summarize the topics found in the articles selected and developed their central themes.

**Result:** Nine studies were found and included in the qualitative synthesis. From the analysis, four domains of experience were highlighted. These were as follows: (a) Home just like a mini-hospital—the home has changed the family environment into a medical environment; (b) endless intensive parenting—intensive and long-term care needs lead to physical and mental fatigue; (c) role transition—the dual role alters the original parenting role; (d) parents and child being together—both parents and children are involved in everything together.

**Conclusion:** Growing numbers of children with medical complexity are cared for at home. Their parents take on additional roles and work more intensely at these roles than they would if their children were healthy. The results of this research provide a deeper understanding of what it means to balance a parenting role while constantly caregiving for a CMC and overcoming the challenges that are faced in their daily lives.

**Keyword:** children with medical complexity, parents' caregiving, perspective, technology-dependent

## I. BACKGROUND

"The caregiving role is nurses or parents, and the needs of intense parental ability are more than a nurse". This statement from a technology-dependent parent's perspective [1, 2] can be viewed in terms of parental needs for home care, as well as the role, abilities and skills of parental care.

Medical equipment and technology have improved significantly over the half century since the 1960s, so children with birth defects, hereditary and neurological problems have reduced mortality, prolonged lives, and better survival rates [3]. According to Cohen et al. [4], CMC are characterized by substantial family medical care, medical fragility, organ functional limitations associated with technology dependence, and the need for multi-disciplinary health resources. With advances in medical instruments and care technology, the number of children with medical complexity (CMC) has gradually increased, and medical home-based care methods such as tracheotomy with mechanical ventilation and gastrostomy tube feeding at home have been developed. Such methods not only improve children's long-term care but also allow children to return to their home environments for care [3].

The transfer of medical care from the hospital to the home environment will disrupt or change the original home environment and daily life, and the environment in which the

family lives changes from a living space to a place filled with many life-sustaining medical systems and other related instruments [5-7]. The parents of CMC assume the responsibilities of learning care skills; handling complex medical care problems for sick children; judgment of disease symptoms; deciding when to seek medical care; providing care at all times, day and night, day after day, regardless of disease symptoms; implementing medical procedures; handling accidental slippage/blockage of the tubing; and troubleshooting medical equipment [1, 2, 5, 8-10]. Moreover, parents caregiving CMC require complex care with regard to not only the intensive labor but also the role of parenting in caregiving as a process that continues in definitely [11, 12]. Those extraordinary responsibilities that parents assume may be linked to multiple parenting roles, a toll on personal health, and disruption of family routines [13].

Previous studies have shown that when parents have CMC at home, they need to take responsibility for learning care skills, handle complex caregiving problems, and make judgments on medical conditions. A number of qualitative studies have been conducted to explore this experience, so the purpose of this study was to perform a qualitative synthesis of previous studies to aggregate the parents' perspectives on caregiving their children at home.

## II. METHOD

Qualitative research is one way of better understanding the views of patients. We carried out a systematic review and thematic synthesis of qualitative studies.

### A. Selection criteria

Papers were selected for inclusion in our study if they reported qualitative findings, such as from interviews or focus groups, and the experience from the perspective of parents had children with medical complexity at home. So the inclusion criteria were qualitative methodology, research on parents' perspective from their daily lives with CMC, and excluded children with behavioral, developmental and/or mental health conditions without technology dependent, quantitative studies, systematic review and the view point from health care providers.

### B. Literature search

Variation in the terminology used for children with medical complexity means that the term sometimes includes children with technology dependence. We carried out a systematic review and thematic synthesis of qualitative studies published between 1998 and 2018 in five electronic data bases (Pub Med, Embase, Cochrane Library, Science Direct, and CINAHL) and other sources in October 2018 using the following search terms: children medical complexity OR medical fragil\* OR technology dependen\* OR ventilator AND parents OR caregiver OR family AND home experience OR perspective (Table I). Articles were included if they contained qualitative data, for example from interviews or focus groups, reporting the views of parents of children with medical complexity or technology dependence. Articles were assessed for quality and analyzed using thematic synthesis.

TABLE I. RESULTS OF SEARCH STRATEGY FOR EACH DATABASE.

keywords	Database	Searching Dates	Result
children medical complexity OR medical fragil* OR technology dependen*OR ventilator AND parents OR caregiver OR family AND home experience OR perspective	PubMed	1998-2018	420
	Embase	1998-2018	478
	Cochrane Library	1998-2018	36
	Science Direct	2008-2018	824
	CINAHL	2008-2018	106
	Other sources		54

### C. Quality of reporting

Papers meeting our inclusion criteria were qualitatively assessed using the Critical Appraisal Skills Program (CASP, 2017) tool that analyses the fundamental of the studies to prevent the inclusion of inadequately reported studies. To ensure the quality of each primary article that the instrument consists of 9 questions to evaluate the congruity between aims, methods, design, data collection, analysis, findings and discussion in the included studies. We appraised the studies independently [14] (Table II). Data extraction and analysis

Data collection and analysis were guided by Thomas and Harden's [15] description of the three stages of thematic synthesis: the coding of text 'line-by-line', developing descriptive themes, and generating analytical themes. To

develop descriptive themes, two reviewers independently coded the texts of 9 original papers—these were chosen as they covered different conditions and provided a breadth of findings—to identify provisional themes according to meaning and content. The two reviewers then discussed their independently derived themes and agreed on a preliminary coding frame of main themes. This coding frame was then applied to the data in all the articles, and the data were coded independently by two reviewers. Any differences between coders were resolved through discussion, and the coding frame was refined where necessary.

After duplicates were removed, the searches produced 408 electronic publications. Titles and abstracts were read. Papers not meeting the inclusion criteria were filtered out and the remaining abstracts (n=168) were reviewed. Of the 26 full-text articles, 17 were excluded, as they did not meet the criteria for inclusion. The 9 remaining articles from 1998 to 2018 described the parents caring for children with medical complexity and their perspectives, so they were included in the review articles (Table III).

TABLE II. QUALITY APPRAISAL CRITERIA AND OUTCOME OF QUALITY ASSESSMENT OF THE 9 INCLUDED ARTICLES

First name, Author year and country	1. Was there a clear statement of the aims of the research?	2. Is a qualitative methodology appropriate?	3. Was the research design appropriate to address the aims of the research?	4. Was the recruitment strategy appropriate to the aims of the research?	5. Was the data collected in a way that addressed the research issue?	6. Has the relationship between researcher and participants been adequately considered?	7. Have ethical issues been taken into consideration?	8. Was the data analysis sufficiently rigorous?	9. Is there a clear statement of findings?	10. How valuable is the research?
Kirk et al. (2005) <sup>[1]</sup>	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Woodgate et al. (2015) <sup>[2]</sup>	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Wang & Barnard(2008) <sup>[8]</sup>	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
O'Brien et al. (2001) <sup>[13]</sup>	Y	Y	Y	Y	Y	Y	CT	Y	Y	Y
Nicholl et al. (2012) <sup>[17]</sup>	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Carnevale et al. (2006) <sup>[18]</sup>	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Hobson et al. (2011) <sup>[19]</sup>	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Swallow et al. (2010) <sup>[20]</sup>	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Wilson et al.(1998) <sup>[21]</sup>	Y	Y	Y	Y	Y	Y	CT	Y	Y	Y

Y=YES, N=NO, C=Can't Tell



TABLE III. DETAILS OF STUDIES INCLUDED IN THE REVIEW.

Author year and country <sup>⓪</sup>	Research topic <sup>⓪</sup>	Research question or aim <sup>⓪</sup>	Research design & Samples size <sup>⓪</sup>	Results <sup>⓪</sup>
Kirk (2005) [14]UK <sup>⓪</sup>	Parent or nurse? <sup>⓪</sup> The experience of being the parent of a technology-dependent child <sup>⓪</sup>	To explore parents' experiences of caring for a child <sup>⓪</sup> who is dependent on medical technology, and in particular of performing clinical <sup>⓪</sup> procedures on their own children <sup>⓪</sup>	Qualitative ethnographic methods of interviewing and photo voice; Mothers <sup>⓪</sup> (n = 39) Fathers (n = 29) <sup>⓪</sup>	1. Context of parenting: transformed meaning of home. <sup>⓪</sup> 2. Dual roles: parent and nurse. <sup>⓪</sup> 3. Being a parent: parental caregiving and professional nursing. <sup>⓪</sup>
Woodgate et al. (2015)[21] Canada <sup>⓪</sup>	Intense parenting: a qualitative study <sup>⓪</sup>	To add to our understanding of the roles parents <sup>⓪</sup> assume in parenting their children with complex care needs <sup>⓪</sup>	A qualitative research design of ethnography, 68 parents from 40 families <sup>⓪</sup>	The main theme is supported by four sub-themes: <sup>⓪</sup> 1) the good parent; <sup>⓪</sup> 2) more than a nurse; <sup>⓪</sup> 3) there's just not enough; <sup>⓪</sup> 4) it takes a toll on the health of parents <sup>⓪</sup>
Wang & Barnard (2008)[7] Taiwan <sup>⓪</sup>	Caregivers' Experiences at Home With a Ventilator-Dependent Child <sup>⓪</sup>	To describe and identify the qualitatively different experiences of primary caregivers who support ventilator-dependent <sup>⓪</sup> children at home <sup>⓪</sup>	Phenomenological approach to do a face-to-face interviews, 17 primary caregivers <sup>⓪</sup> (11 mothers, 4 fathers, a 15-year-old sibling) <sup>⓪</sup>	1. The medical technology for children is frightening but necessary. <sup>⓪</sup> 2. The difficulty of having the carers at home. <sup>⓪</sup> 3. The experience of changing as a person. <sup>⓪</sup>
O'Brien (2001)[13] Europe <sup>⓪</sup>	Living in a House of Cards: Family Experiences <sup>⓪</sup> With Long-Term Childhood Technology <sup>⓪</sup> Dependence <sup>⓪</sup>	To examine the experience of providing long-term home care for <sup>⓪</sup> the child who is technology dependent from the <sup>⓪</sup> family's point of view <sup>⓪</sup>	A purposive sample of 15 families, a child with technology dependent, and data analysis follow phenomenological <sup>⓪</sup>	1. Phenomena that were described as "living in a house of cards," as characterizing their lives. <sup>⓪</sup> 2. Families attempted to increase the stability of their lives through three main strategies: vigilance, advocacy, and reframing. <sup>⓪</sup>
Nicholl & Begley (2012) [17] Ireland <sup>⓪</sup>	Explicating Caregiving by Mothers of Children With Complex Needs in Ireland: A Phenomenological Study <sup>⓪</sup>	To explore mothers' experiences of caring for a child with complex needs <sup>⓪</sup>	A qualitative phenomenological study, interview with 17 mothers. <sup>⓪</sup>	1. Normal mothering <sup>⓪</sup> 2. Technical caregiving <sup>⓪</sup> 3. Preemptive caregiving <sup>⓪</sup> 4. Individualized caregiving <sup>⓪</sup>
Carnevale et al.(2006)[15] Canada <sup>⓪</sup>	Daily living with distress and enrichment: the moral experience of families with ventilator-dependent <sup>⓪</sup> assisted children at home <sup>⓪</sup>	To uncover the moral experience of families with a child <sup>⓪</sup> who requires assisted ventilation at home <sup>⓪</sup>	Design: qualitative, interpretive, 38 family members <sup>⓪</sup>	1. Parental responsibility <sup>⓪</sup> was often stressful and sometimes overwhelming. <sup>⓪</sup> 2. Parents and families <sup>⓪</sup> sought normalization through establishment of routines and stability. <sup>⓪</sup>
Author year and country <sup>⓪</sup>	Research topic <sup>⓪</sup>	Research question or aim <sup>⓪</sup>	Research design & Samples size <sup>⓪</sup>	Results <sup>⓪</sup>
Hobson & Noyes (2011) [19]UK <sup>⓪</sup>	Fatherhood and children with complex <sup>⓪</sup> healthcare needs: qualitative study of <sup>⓪</sup> fathering, caring and parenting <sup>⓪</sup>	To describe their experiences of fathering <sup>⓪</sup> , parenting and caring. <sup>⓪</sup>	Phenomenological approach in-depth qualitative interviews with 8 fathers <sup>⓪</sup>	1. What fathers did for their children: full-time fathers and carers. <sup>⓪</sup> 2. Fathers' experience of caregiving: creating <sup>⓪</sup> normality for children and families <sup>⓪</sup>
Swallow et al. (2010) [20]USA <sup>⓪</sup>	Fathers and mothers developing skills in managing <sup>⓪</sup> children's long-term medical conditions: how do their qualitative accounts compare? <sup>⓪</sup>	To obtain and compare fathers' and mothers' accounts of managing long-term kidney conditions <sup>⓪</sup>	Qualitative study semi-structured interviews with 14 <sup>⓪</sup> couples <sup>⓪</sup>	1. Sharing/negotiating <sup>⓪</sup> caregiving <sup>⓪</sup> 2. Adapting to treatment regimens <sup>⓪</sup> 3. Communicating <sup>⓪</sup> 4. Processing large amounts of information <sup>⓪</sup>
Wilson et al.(1998)[21] Canada <sup>⓪</sup>	Absolute involvement : the experience of others of ventilator-dependent <sup>⓪</sup> children <sup>⓪</sup>	The research question for this study was what is the experience of mothers providing home care for their ventilator-dependent child? <sup>⓪</sup>	Using grounded theory, sixteen mothers resultant 32 interviews were transcribed. <sup>⓪</sup>	The Model of Absolute Involvement consisted of the attributes of mothering, meeting the demands of caregiving, and employing strategies of care. <sup>⓪</sup>

The flow chart (Figure 1)

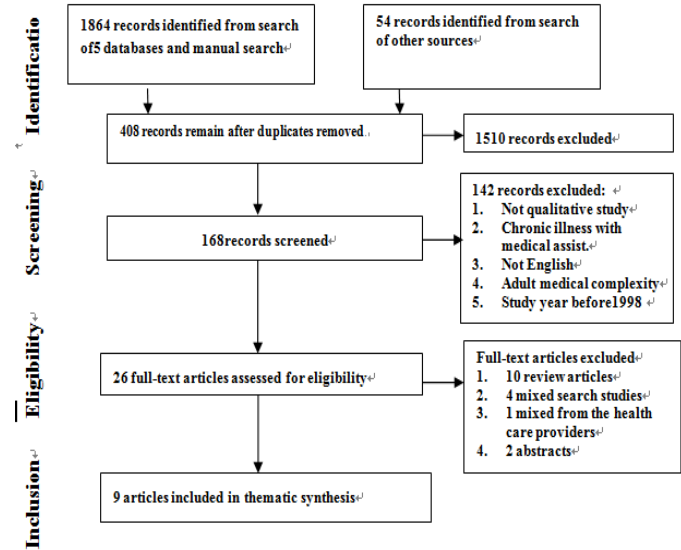


Figure 1 Literature search &amp; screening flowchart based on PRISMA reporting flowchart [15]

### III. RESULT

Nine studies met the inclusion criteria and were included for review and evaluation by two independent reviewers, were conducted in urban and rural areas in the UK[1,19], Europe[13], Taiwan[8], Canada[2,18,21], Ireland[17] and the USA[19]. The data collection methods used in the studies were individual interviews based on strategic or purposeful sampling and qualitative thematic analysis. Our analysis produced four domains: (a) home just like a mini-hospital (b) endlessness of intensive parenting; (c) role transition; (d) parents and child being together.

#### 3.1 Home just like a mini-hospital

From the parents' point of view, the familiar home environment was transformed into a medical home environment like a mini-hospital, changing the meaning of the home [1,8,13,17].

One mother described how she associated her child's bedroom with a 'mini-hospital' because of the presence of equipment: She's got a cupboard in her bedroom that's totally full of everything she needs. Needles, syringes, gauze, everything we need for her. So it's like a medical cupboard. Actually her bedroom is like a mini-hospital. There is everything you can think of that we'd use in hospital is there. (Family A24: mother) [1]

Families caring for a technology-dependent child at home encounter hardships often requiring some form of technological support (e.g., mechanical ventilation, oxygen therapy) [1,2,8,18,21]. Technical caregiving regularly involved undertaking complex care techniques, including the management of bowel washouts, urinary catheterization, and administration of medications, as well as the use of medical devices such as oxygen saturation monitors, suction, and feeding pumps [17]. Parents' constructs of parenting were highly influenced by the transformed meaning of their homes and by the presence of medical equipment and professional providers, such as nurses.

### 3.2. Endless effort and intensive parenting

Parents needed to devote extraordinary care and attention to their children's needs. Parents felt "stuck" at home because they had to be there all the time to meet their children's needs [2,18, 21].

No, it didn't go smoothly because when we first got her out, it was nine months. She was back in the hospital within two days with a serious infection with (inaudible) and 24-hour feed, the equipment never worked, the pumps wouldn't go. We were always at emergency at midnight. I was off. I never got any sleep (Mother 9) [2].

The intensive and long-term care needs, physical and mental fatigue and constant demands associated with caregiving can adversely affect the physical and mental health of caregivers. Intensive parenting involves parents taking on a variety of roles to meet the needs of their children: health care provider, case manager, student, teacher, detective, guard, and advocate [2].

He gets his meds at nine in the morning, nine at night, um and all his appointments we've been going to, and there's the feeding tube...Before I had that electrical pump, we were doing it just through the nose, so then they gave me a stethoscope and all sorts of supplies and stuff and I would check for placement in his stomach. And like even at the hospital, too, I did his vitals and everything, like I did lots for him to help out the nurses, like when I was there. I just kind of watched and I just started doing it because they would say, "Okay I'll be right back in five minutes." Well then you'd see the nurse walking by, and you know they were busy (Mother 8) [2].

In addition, the child's unpredictable health condition can change any time, necessitating vigilance and intense technical procedures to meet the medical complexity of the child's condition and needs[18,19].Parents developed skills for monitoring early signs of deterioration or changes in normal patterns and often implemented medical treatments on their own [1].They observed how their child's condition changed through constant monitoring at all times[17].Parents struggled with significant emotional strain, the physical and psychological dependence of the child, the impact on family relationships, living with the daily threat of death, and feeling that they had no choice but to agree to the technology dependency because they would never let their child die [17]. The complexity of the child's special health care needs made it difficult for parents to accept support, resulting in social isolation [1,18]. Parents reported a deep sense of isolation that defined their role and relationship to their child as primarily one of parenting by differentiating parental caregiving and its underpinning knowledge from that of professionals, particularly nurses [17].

### 3.3. Role transition

The role transition involved two aspects: adaptation of the parental role, and development of clinical expertise. They learned to recognize the importance of subtle but significant clinical changes [1,18].

The thing that I find hard to cope with is that it's my son and it's seeing him in distress that tears you apart inside, you know...O really struggles to breathe while you're doing it,

and that's the bit I find hard to cope with. (Family A15: father) [1].

Father 7 highlighted part of his role as follows: '.. doing medications and setting pumps up is nothing but it's totally different when you're giving IVs [intravenous drugs]... because I can go to bed early whereas when she's on IVs I can't go till 12 till after 12 at night because at 12 is when she'd have the last one' [19].

While adapting their role, they struggled with the dual role and the original parenting role [1,2,19]. The key feature was that the nature of the care they were providing was totally different from that of normal parents, which involved meeting the child's physical needs, including dressing, bathing, and toileting, and maintaining child's safety [17]. However, performing clinical procedures on their child was described as being the most distressing part of caregiving, because it could involve deliberately inflicting pain on their own child and aspects that were like being a nurse. Parents redefined their primary role as a parent and related the unique and different knowledge that they possessed as parents, which nurses could not have. They especially recognized that their emotional connection to the child differentiated them from nurses, and they felt they could personalize their care because of their unique knowledge of the child. Parents recalled how balancing the whole family's needs to accommodate the ongoing demands of the condition required careful planning and negotiation. The quality of parents' contributions to expert management of their child's medical condition may affect children's clinical care, such as coordinating the many aspects of home-based care [1,2,20].

### 3.4. Parents and child being together

Living with a CMC at home creates a complex tension between the distresses and enrichments that arise out of this experience [18]. Having a CMC left no freedom for the parents regarding what they could do to cope with life [1,3,13,20].

Father 1 described this as: 'It's seeing her being involved and I think the rewarding thing is being able to involve her in everything that everyone else is doing'[20].

Parents faced overwhelming challenges while caregiving their child, including worrying about the child's disease progress, assuming responsibility for intensive care, and learning a role [19].They could not imagine life without the enrichments and rewards available from living with their child[16]. It was clear that parents worked hard to overcome these day-to-day challenges to deal not only with their child's complex medical situation but also with the constantly life-threatening condition [17,18].Parents acquired knowledge and experience of daily caregiving with which to develop the skill to judge the child's medical condition and notify health care providers when their child required professional help [1,2,5,6,13,19]. Through the qualitative synthesis, we found that seeking the normal process of care imposed changes on the family routine and highlighted the need for and importance of support from the healthcare team to guide and clarify the doubts as well as the adoption of other coping strategies of this new routine to Change priorities and provide a 'normal' life[1,13,19,20].

Father 2 described his attempts to constantly maintain normal family life and include his child in all aspects of life : 'My philosophy on anything is you don't give in on things so

I'll always make time and effort to do what I can with him, as much as I can to do for him I will, so the weekend's devoted to (child), there's not much space to do anything else, we try to make sure that we have as normal a life as we can...'[20].

Normalization efforts included striving for stability and seeking normality; parents devoted significant efforts toward normalizing their experiences and transformed the meaning of caregiving. They created common routines so that their lives could resemble those of 'normal' families.

#### IV. DISCUSSION

The findings of this qualitative synthesis are significant and contribute new knowledge of what it means to be a parent of a CMC at home. We identified 4 domains inductively developed from the analysis of experiencing caregiving at home. Parents of children with medical complexity have described the huge responsibility of providing advanced care for a child. The home care experience for parents of such patients includes being a parent, learning a role, facing a dual role, handling complex care needs, and managing long-term dependency. It is hoped that clinical nurses will be aware of the parents' experiences of caregiving complex medical children and provide appropriate care and support. The role of parenting in such cases involves endless caregiving of CMC, who require constant vigilance. This is perhaps the most accurate description of the role of CMC parenting [13]. Little research has mentioned that technology dependent children need to create routines so that their lives are similar to those of normal families. This is the key point for the parents to adapt to the new life. The motivation for these efforts is the fundamental striving for a stable family and stable private lives [17].

#### V. CONCLUSION

This synthesis provides a deeper understanding of what it means to balance the parenting role for both parents and nurses, who provide constant caregiving to CMC to overcome the challenges they face in daily lives. The caregiving of a CMC has serious implications for the parents, requiring adaptations of the home environment to provide care for their child and changes in the family's daily routine. Understanding parents' perceptions of caregiving their child at home may help shape the picture of the feelings of caregivers. As the complexity of care delivered by parents continues to develop, synthesized knowledge can provide an evidence base that will support and guide nurses when caring for these families. In the clinical practice field, nurses play a key role in understanding the parents' suffering, and knowledge of how these parents manage their daily lives can support nurses and guide them in their efforts to alleviate suffering. This knowledge can also guide nurse educators in their teaching role and ensure that the needs of parents are taken into consideration when curriculum plans are developed.

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# Exploring cancer patients' family caregivers views of cancer patients' choice of hospice

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## Abstract

The Hospice Foundation and the first hospice ward were established by the Mackay Memorial Hospital in 1990 in Taiwan. The development of the hospice (also known as palliative care) is gradually seen as more important. When patients or family caregivers face the terminal stage of a disease they may not know how to choose the best option for treatment. This is due to a lack of knowledge regarding hospice or palliative care. If a deeper understanding of how cancer family caregivers see cancer patients' use of hospice facilities health care professionals will be able to provide better care and referrals.

A qualitative research approach (based on grounded theory) was utilized in this study to explore how cancer family caregivers see cancer patients' use of hospices. Semi-structured, in-depth interviews and grounded theory were used for data collection. In addition to this, a grounded theory approach to analyze was used in order to obtain how cancer family caregivers see cancer patients' use of hospice. This study found discovered several dimensions. These included: "do not let the patient suffer", "there are people (health care professionals) here to help", "both the patients and the family are able to obtain peace (when they go to the hospice service)", "afraid of hospice, the patients and the family are not prepared", "exchange views of hospice among cancer patients' family", "respect the patient's will" and "hospice care for terminal patients, it's the result of human dignity". As a result of this study, health care professionals are able to understand the context of family caregivers see cancer patients' use of hospices; moreover, they may able to offer better advice relating to hospice use in the future.

**Keyword: palliative care, qualitative research, family caregiver**

## I. INTRODUCTION

Since the establishment of the Hospice Care Foundation and the first palliative care ward in Taiwan in the Macay Memorial Hospital in 1990, Taiwan has continuous promoted palliative care. More and more people have used palliative care in their final journey of life. However, the education that promotes palliative care still needs to be strengthened. When facing the suffering and death, patients, caregivers and nursing professionals are all under stress (Augusto Landa, López- Zafra, Berrios Martos, & Aguilar-Luzón, 2008). Therefore, the multiple roles for nursing professionals in coordination, endorsement, education and research are very important (Li, Yang, Su, 2009). Further, the primary caregiver needs to consider the patient's future disease progression, advance care planning (Merel, DeMers, & Vig, 2014). When good end-of- life care can improve the life of the terminal patient, the timing of intervention in palliative care becomes important (Choi, Chang, Song, Jho, & Lee, 2013).

Because the progress of medical technology, as well as the rise of knowledge standards and the rise of consumer awareness, the quality of medical care draw more and more attention from people. Therefore, it has also raised people's expectations for medical care. On the other hand, it is unreasonable to hope that the advance of medical treatment can control or prolong human life. Hence, it essential to enhance good care quality for the patients at the end of life period. The public's acceptance of palliative care may be influenced by stereotypes. If we can understand how family

practice when patients need palliative care. Because there are few literatures on the knowledge and understanding of the palliative care of the family members of cancer patients in Taiwan, this study utilised qualitative research to explore cancer patients' family caregivers views of cancer patients' choice of palliative care. the purpose of this study was to explore the process by which family members of cancer patients choose palliative care for patients. The aims of this study are:

- Exploring the views of family members of cancer patients on palliative care
- Explore the process understanding regarding family members of cancer patient's choice of palliative care

## II. METHODS

The grounded theory is used for this study. One of the characteristics of grounded theory study is the process of data collection, the data analysis is also carried out at the same time. The grounded theory study divides the process of data analysis into three levels: open coding, axial coding, and selective coding.

The researcher recruited the family of cancer patients in one hospital in the central part of Taiwan. The family members of the cancer patients may also inform the researchers the willingness of participating in the study. Furthermore, the researchers invited the family members of the cancer patients to participate in the interview. In the process of seeking the participants, Family

members and cancer patients choose palliative care, then it is expected to provide better care and referral in the clinical

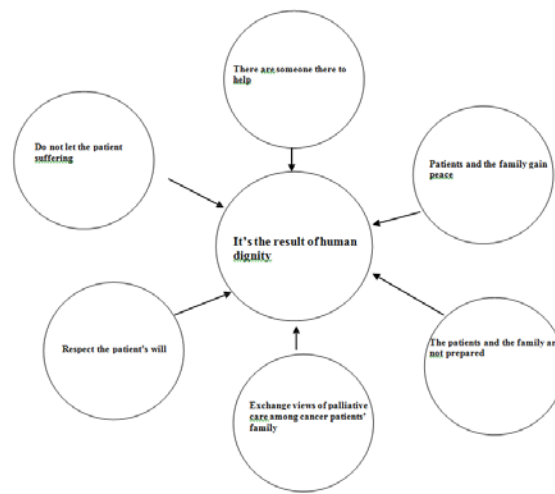


Fig. 1: cancer patients' family caregivers views of cancer patients' choice of palliative carepatients' choice of palliative care

members of cancer patients are invited to recommend potential participants for interviews. Research purpose and explanation, and the interview process requires recording are explained prior the interview.

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### III.FINDINGS

This study found several dimensions which include: "do not let the patient suffering", "there are someone (health care professionals) here to help", "patients and the family gain peace (got the hospice service)", "the patients and the family are not prepared", "exchange views of hospice among cancer patients' family", "respect the patient's will" and "it's the result of human dignity". (See Figure.1)

### IV. DISCUSSION AND CONCLUSION

At the end, palliative care use is an important issue from family's perspective. Further, understanding family of cancer patients' responses and actions to people with cancer who use palliative care is essential for both

patients and family. Through this study, health care professionals are able to understand the context of family caregivers see cancer patients' use of palliative care. In addition, the findings may help health care professionals give more help to patients and family when they need. Moreover, health care professionals may able to offer better to patients and family in the future.

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# Development of the belief in treatment effectiveness scale for adults with chronic low back pain

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## Abstract

Belief in treatment effectiveness influences compliancy with treatment and self-management performance. However, at the time of writing, there were no instruments to assess the belief in treatment effectiveness among adults with chronic lower back pain (CLBP). Hence, this study aimed to develop the Belief in Treatment Effectiveness Scale (BTES). The BTES was developed based on DeVellis's guidelines for scale development. The development steps included the following. (1) The belief in treatment effectiveness concept was reviewed in order to generate the ideas for measurement. (2) An item pool was generated which reflected the objective of the definition of term and scale. (3) The Likert scale was determined to be the response format that would be used. (4) The initial items were reviewed by six experts. (5) The inclusion of validation items that served to detect problems were considered. (6) A sample of 277 participants was selected. (7) The items were evaluated using factor analysis, contrasted-groups approach, and internal consistency reliability. (8) The scale length was optimized based on the scale's reliability. The resulting BTES comprised 12 items with a 5-point Likert scale for each item. The content validity for both ICVI and S-CVI/Ave were found to be 1.00. The construct validity was examined using the factor analysis and contrasted-groups approaches. The BTES accounted for 58.96 % of total variance explained with eigenvalues ranging from 1.30 to 4.25. The contrasted-groups approach showed that the BTES scores were significantly different for different groups of patients. The overall Cronbach's alpha reliability was found to be 0.87. The BTES was developed which had twelve response variables. It was concluded that the psychometric properties were acceptable and that this scale could be effective if it is used for adults with CLBP.

**Keywords:** Belief in treatment effectiveness, Scale development, Chronic low back pain

## I. INTRODUCTION

Belief in treatment effectiveness is a person's thoughts about effectiveness of treatment [1]. A person's belief leads to the refusal or acceptance of treatment that a health care provider judges to be of an overall benefit to them; this belief affects the person's day-to-day practices [2-4].

Adults are considered to have CLBP after living with pain for more than three months [5-8]. CLBP consists of symptoms; it is not a disease [8-9]. Pain ordinarily occurs in the lower back and may radiate or refer to other parts of the body, mostly to the legs or feet. The pain patterns can be divided into three patterns: (1) back pain, (2) leg pain, and (3) a combination of back and leg pain [10-11]. Back pain is pain in the lower back area. Pain may radiate to legs but not beyond the knees [10]. Leg pain is the pain that is radiated from the lower back to one or both legs; the affected areas are the lower limbs below the knees. Some patients have combined back and leg pain resulting from Cauda Equina Syndrome, which is a special type of lumbar nerve roots syndrome. Cauda Equina Syndrome has a characteristic pattern of neuromuscular, and urogenital symptoms [10,12].

CLBP leads to several impacts. Physical disability is the most common impact among CLBP [10,13]. Adults with CLBP who have a physical disability have difficulty with activities of daily living [14], and this difficulty leads them to rely on others for support. This is especially true for those with permanent disability [13,15]. Persistent pain and physical disability also causes psychosocial impacts. These included depression (21.4% of Brazilian people with CLBP) [16],

moderate depression and anxiety levels (30.2% of Thais with CLBP) [17], fear of movement (11.5% of all Brazilian people with CLBP) [16], and reduced social participation [18], as well as being isolated from their society [19]. Moreover, CLBP leads to an economic burden due to the high cost of treatments, and absence from work [20-22]. Thus, adults with CLBP need treatments to reduce pain and prevent permanence of physical disability.

Belief in a treatment's effectiveness affects the compliance with the treatments and self-management achievement, both of which leading to positively health behavior and health status [1,23-25]. Conversely, one who does not have belief in treatment effectiveness may ignore the pain, or not comply with the treatment, resulting in ineffective outcomes. The pain lasts until it becomes long-term CLBP, and this may worsen spinal function leading to physical disability [2-4,13]. In Thailand, adults with CLBP often take medications to manage their pain without a prescription, leading to them having adverse side effects from pain killers. Furthermore, they used non-pharmacological treatment for pain relief according to their beliefs, such as universal energy, sacred thoughts, superstition, massage, and avoiding injurious food [19]. Hence, the measurement of belief in treatment effectiveness is significant for adults with CLBP to make a plan for compliance with treatment and self-management performance in order to control pain and prevent permanent physical disability.

There are some instruments for assessing belief in treatment effectiveness, such as the Chinese version of the Perceived Treatment Effectiveness Scale. This scale assesses the perception of the importance of self-care activities for

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controlling diabetes and preventing diabetes complications. The scale consists of 9 items on a 5-point Likert scale whereby a high score indicates a high belief in the importance of diabetes self-management in managing diabetes [23]. Another instrument, the treatment effectiveness questionnaire is a part of the Personal Models Interviews which measures the belief in treatment effectiveness in osteoarthritis and diabetes patients [25]. However, these scales cannot measure belief in treatment effectiveness in adults with CLBP. Furthermore, there are no instruments to assess specifically the belief in treatment effectiveness among adults with CLBP. Consequently, the researcher developed the Belief in Treatment Effectiveness Scale (BTES) specifically to measure belief in treatment effectiveness among adults with CLBP.

## II. CONCEPTUAL FRAMEWORK

The belief of treatment effectiveness influences the compliance and effectiveness of the treatments; this belief also affects physical impairment or treatment outcome. There are many kinds of CLBP treatment, which can be arranged into three groups: pharmacological, non-pharmacological, and surgical treatments.

Pharmacological treatments comprise medications that are recommended with several guidelines for the management of CLBP, such as acetaminophen, nonsteroidal anti-inflammatory drugs (NSAIDs), tricyclic antidepressants (TCAs), opioid analgesics, muscle relaxants, anti-convulsions, systemic corticosteroids, and herbal medicines [5-8,26].

Adults with CLBP also commonly use non-pharmacological treatment options that have been shown to have some benefit in improving pain or function, including exercise therapy, massage, acupuncture, yoga, education, rehabilitation programs, relaxation techniques, lifestyle modification, and others [5-8,27-28].

As for surgical treatment, most patients with CLBP will not benefit from surgery. Nevertheless, surgery is considered a treatment option for patients with CLBP after failure of pharmacological and non-pharmacological treatments caused by nerve root compression or severe CLBP, such as spinal stenosis with leg pain or claudication [26]. Surgical treatments usually performed on CLBP patients include: lumbar laminectomy (or convention technique), lumbar spinal fusion (or arthrodesis), lumbar disc arthroplasty, and minimally invasive spine surgery (MISS) [11,29-32].

Belief in treatment effectiveness is a concept for measurement derived from Skinner, TC. & Hampson SE. [1], Xu, Y. *et al.* [23], and literature review. [5-15,25-28,33-34]. The authors in [1] divided the belief in treatment effectiveness into two dimensions: (1) the effectiveness of regimen to control symptoms/disease on a day-to-day basis and (2) the effectiveness of regimen to prevention of long-term complications of the disease/condition. The authors in [23] described belief in treatment effectiveness as the perception of the importance of self-management activities to control diabetes and prevent diabetes complications. Hence, in this study, the definition of the belief in treatment effectiveness is defined as “the person’s thoughts about the effect of CLBP treatment to control pain and prevent long-term disability [33]”.

The instrument developed in this research examined psychometric properties of belief in treatment on a scale based on DeVellis’s guidelines for scale development [35] to measure the adult with CLBP’s thoughts about the result of treatments for controlling pain and preventing long-term disability.

## III. METHODS

### A. Study design

An instrument development research design was used to develop the Belief in Treatment Effectiveness Scale (BTES).

### B. Sample and setting

The inclusion criteria restricted the sample to Thai adults with CLBP and acute low back pain (ALBP) whose ages ranged from 30 to 60 years with Thai-language literacy. Exclusion criteria were psychiatric disorders, substance abuse, or a history of lower back surgery.

The sample size was calculated by following statistical analysis of each psychometric evaluation on the scale. In this study, the sample sizes were 216 adults with CLBP and 64 adults with ALBP.

The setting for collecting data was the orthopedic outpatient department at Maharaj Nakorn Chiang Mai Hospital, Chiang Mai Province, Thailand.

### C. Ethical considerations

The study was approved by the Research Ethics Committee of the Faculty of Nursing, and the Faculty of Medicine, Chiang Mai University. Furthermore, a permission letter from the Maharaj Nakorn Chiang Mai Hospital was gained before the sample recruitment process began. All participants received an explanation of the objective, methods, and time required to complete the questions. They were also protected with the principles of human rights protection that consisted of three principles: beneficence, respect for human dignity, and justice.

### D. Data collection and analysis

The BTES scale was developed by using DeVellis’s guidelines for scale development [35]; each step is described as follows:

*The first step* was the determination of a clear idea for measurement. The researcher used a belief in treatment effectiveness concept which was derived from literature review of CLBP knowledge together with the belief in treatment effectiveness concept [1,5-15,23,25-28,33-34]. Belief in treatment effectiveness refers to “the person’s thoughts about the efficacy of CLBP treatment to control pain and prevent long-term disability [33]”.

*The second step*, generating an item pool, included four steps. Firstly, the researcher chose items that reflected the scale’s objective and selected the BTES to measure belief about treatment effectiveness in adults with CLBP. Secondly, the researcher began with the process of writing items. Each item was written based on the definition of belief in treatment effectiveness, literature review of CLBP knowledge, and the scale’s objectives. Thirdly, the researcher checked for redundancy and characteristic of good or bad items. For instance, the phrase of “physical exercises or back and



abdominal muscles exercises” was redundant so “physical exercises” was removed from the sixth item. Furthermore, the BTES was checked in regards to the difficulty in reading of all items, avoiding ambiguous pronoun references, and creating one idea per one item. Finally, the researcher used positively worded items and revised or removed negatively worded items in order to minimize the confusion of respondents. The initial items pool consisted of 12 items.

*The third step* was the determination of the format for measurement. The researcher used the Likert scale format for the BTES. The BTES was a 5-point Likert scale ranging from 1 = “not at all effective” to 5 = “most effective”. The 5 points of the response options provided the opportunity for gradation [35] and followed the questionnaire of belief in treatment effectiveness of Glasgow and Hampson [34]. The original version of the Likert scale consisted of five response options, with a value of 1 given to the most negative response and a value of 5 to the most positive response [36-37]. Thus, a high score on this scale indicated a high level of the belief in treatment effectiveness.

*The fourth step* was a review of the initial item pool by six experts who were knowledgeable in related areas: (1) adult spinal orthopedic surgery, essentially for CLBP; (2) orthopedic physical therapy; (3) orthopedic and rehabilitation nursing; (4) self-management theory and adults nursing; (5) neurosciences and neurology nursing, as well as nursing theory; and (6) scientific and theoretical perspectives of nursing theory development and adult nursing in chronic illness. The researcher revised the item pool, following the experts’ recommendations, including changing some words such as the words “You” to “I”, “exercise” to “Back and abdominal muscle exercises”, and added “norgesic” into the example of muscle relaxant drugs. The pool of new items consisted of 12 items. The first dimension, effectiveness of the regimen areas to control pain on a day to day basis, comprised items C1 to C8. The second dimension, effectiveness of the regimen areas to prevent long-term disability of the CLBP, included the items P9 to P12. The possible total of scores ranged from 12 to 60. For the purpose of description, the score was classified into three levels by class interval [38]: low belief in treatment effectiveness (12-27), moderate belief in treatment effectiveness (28-43), and high belief in treatment effectiveness (44-60).

*The fifth step* was considering the inclusion of validation items. In this step, the researchers considered and chose items to include in the BTES in order to serve to detect flaws or problems and checked the social desirability of each item. None of the 12 items had problems for assessing the belief in treatment effectiveness, nor were any of them of concern regarding social desirability in interpreting responses to socially related measures. Additionally, the validity of the items were considered by content validity analysis.

*The sixth step* was to administer items to a development sample which was calculated by following the statistical analysis. The estimation of sample size was 280 participants. However, three participants did not respond to several of the questions, so the final number of participants with no missing data was 277.

*The seventh step* was the evaluation of the items that consisted of factor analysis, contrasted-groups approach, and

internal consistency reliability.

*7.1 Factor analysis.* The new pool of 12 items were administered to the sample for testing factor analysis. For the factor analysis, the researcher used 10 participants per variable to calculate sample size [39]. The estimated sample size of this calculation was 120 participants. Given a 10% allowance (12 participants) for attrition and missing data, this study required a sample size of 132 participants. Exploratory factor analysis (EFA) was analyzed for construct validation with maximum likelihood, as well as principal component method using a rotation method with Varimax with Kaiser Normalization [40]. Confirmatory factor analysis (CFA) was used to test the factorial validity of a theory construct which was analyzed by AMOS.

The results of testing assumptions of factor analysis revealed that Bartlett’s test of sphericity was significant ( $\chi^2 = 484.95$ ,  $df = 66$ ,  $p < .01$ ), acceptance of the hypothesis, indicated that sufficient correlations exist among the items to proceed to factor analysis. Kaiser-Meyer-Olkin was at .78, which indicated the sample’s adequacy for factor analysis [40].

*7.2 The contrasted-groups approach.* The researcher used two groups: adults who were known to have CLBP and adults who had ALBP. The difference of the two groups was assessed by an independent t-test [41]. The estimation of sample size based on t-test used Cohen’s tables. The researcher used the table for the t-test at the power of 0.80 and effect size of 0.50; hence, the estimation of the sample size was 64 participants per group [42]. Finally, 64 adults with CLBP and 64 adults with ALBP completed the BTES. Thus, data was sufficient for analysis using the independent t-test.

The results of the tested assumptions of t-test revealed that the data distribution was non-normal. Of these tests, the scores of adults with CLBP had skewness = 1.15, kurtosis = 1.05, and Kolmogorov-Smirnov test =  $p < .00$ , and the scores of adults with ALBP had the skewness = -.59, kurtosis = -.39, and Kolmogorov-Smirnov test =  $p < .01$ . These results indicated that data of adults with CLBP and adults with ALBP were non-normal distributions. Hence, the research used Mann-Whitney U test for analyzing data of the contrasted-groups approach.

*7.3 Internal consistency reliability.* This reliability was used for 20 adults with CLBP; all participants completed the data of the scale, so the data was sufficient for analysis.

*The final step* was to optimize scale length. The researcher investigated a pool of items using Cronbach’s Alpha of items.

## IV. RESULTS

The BTES comprised of 12 items. Each item was on a 5-point Likert scale ranging from 1 = “not at all effective” to 5 = “most effective”. The possible total of scores ranged from 12 to 60. As for content validity, both ICVI and S-CVI/Ave were at 1.00.

Construct validity was examined by factor analysis and contrasted-groups approach. The EFA showed that the BTES accounted for 58.96 % of the total variance, which was explained by eigenvalues ranging from 1.30 to 4.25. All 12 items were divided into three dimensions: dimension 1: F1

(C5-7, P10-11); dimension 2: F2, (C1-4); and dimension 3: F3 (C8, P12). (TABLE I)

TABLE I. EXPLORATORY FACTOR ANALYSIS: DIMENSION ASSOCIATIONS OF FACTOR ANALYSIS OF THE BTES (N = 129)

Item Number/Dimension	Component		
	1	2	3
	Factor Loading	Factor Loading	Factor Loading
Dimension 1			
C6	.85		
C7	.73		
P11	.73		
P10	.59		
C5	.54		
P9	.54		
Dimension 2			
C2		.79	
C3		.73	
C4		.73	
C1		.64	
Dimension 3			
C8			.87
P12			.86

Extraction Method: Principal Component Analysis  
 Rotation Method: Varimax with Kaiser Normalization  
 Total variance explained = 58.96 %  
 Eigenvalues range = 1.30 – 4.25

The testing the factorial validity of a theory construct was analyzed by confirmatory factor analysis (CFA). The results revealed that standardized root mean square residual (RMR) value was .071, indicating that the model was a well-fitting. The Goodness-of-fit Index (GFI) was .907, and the Comparative Fit Index (CFI) was .928, reflecting a fitting model. The CFA model is presented in figure 1.

For the contrasted-groups approach, the BTES was significantly different for the groups. For internal consistency reliability, the Cronbach's alpha of pain control and disability prevention, pain relief medication, and surgical treatment were at .80, .85, and .89, respectively, and overall reliability was at .87. (TABLE II)

TABLE II. THE CONTENT VALIDITY, CONSTASTING GROUPS, AND RELIABILITY OF BTES.

Contrasting Groups (n = 64 per group)	Internal Consistency Reliability (n = 20)
Mann-Whitney U test: mean rank:	pain control and disability prevention = .80
Adults with CLBP group = 80.74	pain relief medication = .85
Adults with ALBP group = 48.26	surgical treatment = .89
	overall reliability = .87

p < .00

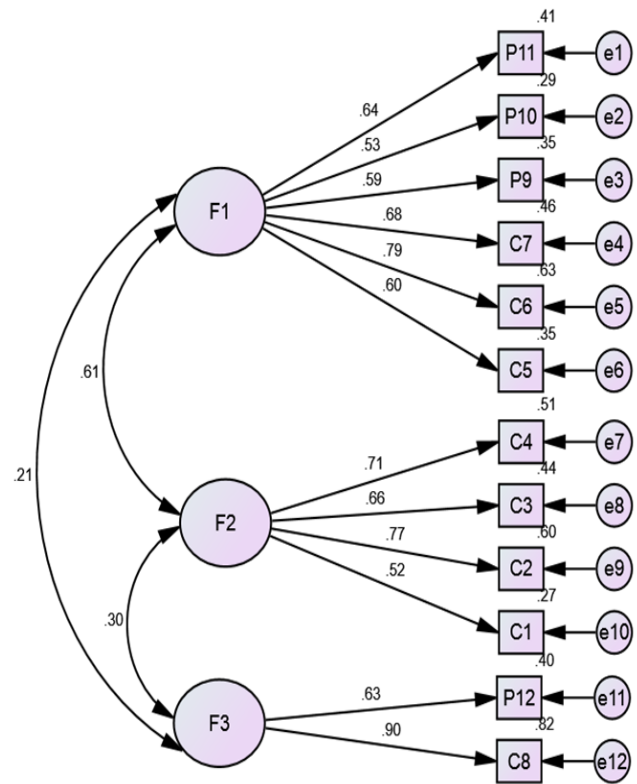


Fig. 1. Confirmatory factor analysis (CFA) model.

## V. DISCUSSION

The Belief in Treatment Effectiveness Scale (BTES) is a new instrument which was developed by the researcher. The belief in treatment effectiveness concept was derived from literature review of CLBP knowledge and belief in treatment effectiveness concept [1,5-15,23,25-28,33-34]. Belief in treatment effectiveness defined as the person's thoughts about the effectiveness of treatment for CLBP involving the effectiveness of regimens to control pain on a day-to-day basis and the effectiveness of regimens to prevent long-term disability. The regimens to control pain and prevent long-term disability included pharmacological, non-pharmacological, and surgical treatments [5-8,11,26-32].

The BTES, which aims for psychometric evaluation, is discussed below regarding content validity, construct validity, and reliability.

**Content validity.** The BTES was reviewed for content validity by six experts. These experts were knowledgeable in multiple areas: (1) adult spinal orthopedic surgery, essentially for CLBP; (2) orthopedic physical therapy; (3) orthopedic and rehabilitation nursing; (4) nursing theory and adults nursing; (5) neurosciences and neurology nursing, as well as nursing theory; (6) science and theoretical perspective, nursing theory development, and adult nursing in chronic illness, particularly chronic pain. These experts had knowledge about CLBP knowledge and nursing theory. The characteristics of the experts for reviewing the content validity should consist of persons who had education or experience in phenomena,

clinics, or research studies relevant to the theory or concept for measuring, or instrument development [43]. Therefore, this study lacked an expert who was knowledgeable about belief in treatment effectiveness and instrument development. Nevertheless, the belief in treatment effectiveness concept has not been used or studied in Thailand before, so this is a limitation which was difficult to overcome.

The findings of the content validity review showed that both ICVI and S-CVI/Ave were at 1.00. These levels of content validity were accepted. This finding was consistent with the accepted value of I-CVI that an I-CVI value from 6-8 experts for reviewing is equal to or more than .80 [44-45]. The acceptance of S-CVI/Ave value is .90 [20]. Consequently, the results of I-CVI and S-CVI/Ave levels of content validity of this study were accepted. This result of content validity indicated that this scale had adequacy of items to present the domain of content and relevance of the content domain for interpreting the scores obtained when the measure is employed.

**Construct validity.** The investigation of construct validity of the BTES included factor analysis and contrasted-groups approach, which are discussed and explained as follows:

*Factor analysis* included the researcher using exploratory factor analysis (EFA) [35,40] and confirmatory factor analysis (CFA) to examine construct validity [46]. The EFA is used for determining the nature of the variables underlying an items set [35,40]. The sample size, the final number of 129 participants with no missing data, was sufficient for factor analysis. The general rule of a sample size for factor analysis is that the minimum is to have at least five observations per variable, and the more acceptable sample size should have ten observations per variable [40]. In this study, the final sample size had a 10.75 per variable, indicating that the sample size was accepted and enough for analyzing.

The EFA investigated the eigenvalues that were used for considering the adequacy of extraction and number of components. The findings showed three components with eigenvalues ranging from 1.30 to 4.25. Components with eigenvalues greater than 1 are considered significant, and a component with an eigenvalue less than 1 is not as important. As a result, the BTES had the adequacy of extraction and three components with eigenvalues were significant. Additionally, three components had communalities of .59. The acceptable levels of communality was at .50 as having sufficient explanation [40]. Consequently, the components with communalities of .59 were found to have adequate explanation.

Factor loading was then analyzed. The results of EFA demonstrated that all 12 items were divided into three dimensions. The first dimension included 6 items with a factor loading ranging from .54 to .85, named "Pain control and disability prevention". The second dimension comprised 4 items with a factor loading ranging from .64 to .79, named "Pain relief medication". The third dimension consisted of 2 items with a factor loading ranging from .86 to .87, named "Surgical treatment". The interpretation of factor loading determined that factor loading in the range of  $\pm .30$  to  $\pm .40$  was considered to meet the minimal level for interpretation of structure and  $\pm .50$  or greater was considered practically

significant. Furthermore, guideline for identifying significant factor loading are based on sample size: For significance, factor loading of .30 required 350 participants, .40 required a sample size of 200 participants, .45 needed a sample size of 150 participants, .50 needed a sample of 120 participants, and .60 required a sample size of 85 participants [40]. In this study, the final sample size was 129 participants, and factor loadings of all 12 items or all three dimensions ranged from .54 to .87; thus, these results were significant for factor loading at a level of .50, and this indicated that all 12 items should be included in the BTES.

The findings of CFA revealed that the CFA model fits with the data [46] and confirmed that the BTES included 12 items (three dimensions). The first dimension, pain control and disability prevention, included 6 items (C5-C7,P10-P11). The second dimension, pain relief medication, included 4 items (C1-C4). The final dimension also remained 2 items, which were C8 and P12.

Even though the final scale had three dimensions and some items moved from the initial dimension to a new dimension, this finding of factor analysis allowed these 12 items as the conceptual framework of the belief in treatment effectiveness.

*The contrasted-groups approach* was used for testing the construct validity, which identified groups that were known to have contrasting scores on the scale. The significance of the testing of the contrasted-groups approach increased the validity of the scale in that the scores of groups were as anticipated and can claim construct validity [41,47]. The researcher used the contrasted-groups approach for testing and confirming the construct validity for this study. The results of this study demonstrated that the scale mean scores between two groups of the participants were significantly different (mean rank: Adults with CLBP group = 80.74, adults with ALBP group = 48.26, and Asymp.Sig. (2-tailed) = .00). This finding indicated that the BTES can be used to differentiate belief in treatment effectiveness levels between adults with CLBP and adults with ALBP and had construct validity.

**Internal consistency reliability** is the consistency that evaluates the target attribute and points to a quality of the scale [45]. Alpha coefficient values of .80 or greater are highly desirable and an value of .70 is acceptable [35,45]. In this study, the findings of reliability revealed that the total reliability of the BTES was at .87 and three dimensions ranged from .80 to .89; thus, they were acceptable and indicated the scale was 87%, 80%, and 89% reliable with 13%, 20%, and 11% random error, respectively [47]. Therefore, each item in the BTES can be measured accurately.

## VI. CONCLUSION

The results of the instrument development presented that the BTES had good quality, and can measured the belief in treatment effectiveness in adults with CLBP. The BTES was checked for content validity, and the results of content validity examination demonstrated that it was accepted by both I-CVI and S-CVI/Ave. Regarding construct validity, the BTES tested the construct validity by factor analysis (EFA and CFA) and contrasted-groups approach. However, the BTES had 12 items which were divided into three dimensions: pain control and disability prevention, pain relief medication, and surgical

treatment. The investigation of contrasted-groups approach revealed that mean scores between two groups of all this scale had significant difference; this indicated acceptable construct validity. For reliability, the BTES was tested for internal consistency reliability by Cronbach's coefficient alpha. The BTES had acceptable reliability.

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## **Session of Humanities and Social Sciences**

# An IEP solution to the lessons learned from six years of online proficiency testing associated with the freshman and sophomore English courses in a technology university in Taiwan

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## Abstract

Since 2010, Hungkuang technological university in Taiwan has undertaken an increasingly intensive program of twice yearly online English testing of freshman (1st year) and sophomore (2nd year) students, using both the Bridge and Full Test of English for International Communication (TOEIC) in mock and real versions. A preliminary analysis of 15,613 individual test scores for reading or listening or both yielded a range of relevant findings. These included the following-- (1) Overall mean proficiency on the real Full TOEIC was found to be 111 for listening and 75 for reading which is well below the institutional target of minimum total score 350. Progress was also uncertain between freshman and sophomore years, suggesting some loss of motivation on the part of the students. (2) Differences between Departments revealed effects of some departments doing extra work on English. For example, Physical Therapy Dept. students scored better on reading than listening (Bridge TOEIC), this was possibly due to the English medical textbooks used in the department and a students' self-help reading club. (3) Bridge and Full TOEIC scores correlated with each other well, but actual equivalences found that among our relatively low proficiency students did not match published conversion tables, The Common European Framework of Reference for Languages (CEFR), an international standard for describing language ability on a six-point scale, from A1 for beginners, up to C2 for those who have mastered a language. (4) The mock tests proved to be poor predictors of real test performance. This counts against their use to reduce costs of taking the real tests. Based on the above findings, an intensive English program (IEP) solution was proposed to improve upon the English results. The result shows that the average improvement score was now 123.5 and the highest score reached 800.

**Keyword:** Freshman and Sophomore English course, TOEIC online testing, intensive English program

## I. INTRODUCTION

This paper presents a project undertaken over a number of years, and with the broad characteristics of a piece of action research [1]. In essence, a problem was first perceived by the teachers and administration in a particular educational context: low marks obtained by students in the TOEIC test. An extensive preliminary exploration was performed to illuminate the nature and extent of the problem: analysis of large numbers of TOEIC test scores. These results, amid many valuable findings, led to the formulation of an action to try to remedy the problem: introduction of a newly formulated intensive English program. The action was then executed and its effect assessed: TOEIC scores were much improved.

## II. LITERATURE REVIEW

Research into test results in educational settings has a long history. It may be used to reveal more about learners' ability, of course [2], but is often also used, as in the present case, to inform teachers and administrators about the success of the teaching which students who take a test have been receiving [3]. Consequently, test scores are often used as part of the input to program evaluation [4] and the development of new courses [5], as in the present research.

The new courses that are developed in this way are often very focused on the test or examination which the students, for external reasons, are required to take. Thus they are, in effect, test preparation courses [6]. Their use may be combined with

the implementation of mock tests as practice [7], as in our study. This evidences what is often referred to as the washback or backwash effect of testing on teaching [8].

Due to space limitations a fuller literature review is not undertaken here.

## III. THE CONTEXT OF THE STUDY

Taiwan is an English as a foreign (rather than second) language country, where English plays little part in everyday communication. State sector education at school and university is typically conducted through the medium of Mandarin Chinese, although some private schools and universities function in English. At Hungkuang University (13,000 students), all subjects except specific courses taught by foreign instructors in the Applied English and Restaurant Hospitality Departments are taught through Chinese medium but General English Education is an obligatory course two hours per week for students in all majors in the Freshman and Sophomore years. A standardized English course syllabus has been adopted for all majors at three levels, C, B & A, using books 1, 2 and 3 of a textbook from the same publisher, equivalent to A1, A2, B1 CEFR levels [9]. This English program, together with regular English testing, has been the method used by the university to improve students' English up to the target TOEIC score level required of graduates.

Students who arrive at Hungkuang will typically have gone through the state school system where English is taught

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as a subject from grade 3 for 80 minutes per week. Some however will have started earlier at a private English kindergarten, and most will have attended private 'cram' school concurrent with state school, where English in fact is given more attention in terms of hours per week. Nevertheless, students arrive at Hungkuang with very varied levels of English proficiency, and there is no minimum English proficiency entrance requirement (even for the Applied English Dept.). Students are tested on their orientation day and full-time students are allocated to different English class levels as a result, with adjustments made later if the level they are assigned to appears too easy or difficult for them. Efforts are made to ensure that students do not purposely try to score poorly on the orientation test and so take a class of a lower level than their real ability for an easy ride. Part time students tend to be of a lower proficiency level than full time ones so are all taught at one level (book 1) though there are current plans to differentiate two proficiency levels among them. The students' English needs at university are not deemed to be primarily for academic English (although some departments expect some reading of English textbooks and some students go on to study abroad) but rather for (a) basic English as an international language (EIL) that will be useful for general communication with non-Chinese speakers of English whenever needed in a country that sees itself as a player in today's globalized world where English is the established lingua franca, and (b), basic English for professional purposes (which falls within English for occupational purposes, EOP) that they may need in future work, or at least to meet the English demands of future employers. Hence the textbook focuses on teaching things like office communication, email correspondence, business letters, transmitting commercial information etc. This is done in a general way (EGOP), not specialized to particular realms of future employment such as nursing or catering. Some departments, however, provide additional English courses of their own, which would typically be specialized for the needs of students of a particular major (ESOP).

The program of testing students at the university began in 2010 because it was felt that an internationally valid test was required to serve as a convincing indicator of the university's capacity to compete in the globalized world arena. TOEIC [10] was selected as it seems better targeted on the type of English that the students need. This matches the trend towards taking TOEIC in Taiwan in general (and indeed in Japan), where numbers of takers of the full TOEIC rose from around 68,000 in 2005 to nearly 344,000 in 2014. Again, in line with an increasing world trend [11], online testing was implemented.

#### IV. OBJECTIVE AND QUESTIONS OF THE TEST SCORE EXPLORATION

The present study was initially prompted by the widespread feeling among staff at the university that students were not achieving the levels of English that were expected. Therefore an analysis of student TOEIC scores was undertaken in order to properly understand in a more objective way the extent of this problem. Among the specific questions we asked were:

A. Questions about freshman and sophomore English performance

Is the proficiency of our students on target to achieve institutional targets / CEFR B1?

Does students' proficiency improve over time as they follow the English courses and are tested twice in each academic year? Is there any difference in scores between Departments, and if so, why?

B. Questions about testing with TOEIC

Is testing done too much or too little?

How can we convert between Bridge TOEIC scores and Full TOEIC scores?

#### V. METHOD OF THE TEST SCORE EXPLORATION

The data used consisted of records of student scores on a variety of real and mock/practice versions of the TOEIC test (of listening and reading) which freshman and sophomore students had taken in the normal course of their study at Hungkuang in the period 2010-2015. SPSS 19 and Excel were used for all analysis and statistics.

#### VI. FINDINGS OF THE TEST SCORE EXPLORATION

Is the proficiency of our freshman and sophomore students on target to achieve institutional targets / CEFR B1?

The institutional target on the full TOEIC is in fact 550 for English major students and 350 for non-English majors. 550 equates with B1 in the CEFR, 350 is between A2 and B1 - in fact closer to A2 [10]. Table 1 shows at once that the mean real test scores are nowhere near the thresholds for B1, or the university's target scores. Apart from listening in the full TOEIC, which is A2 (official equivalence 110), real test scores are all around A1, characterized for reading/listening as: "Can understand ... familiar everyday expressions and very basic phrases aimed at the satisfaction of needs of a concrete type. ... Can interact in a simple way provided the other person talks slowly and clearly and is prepared to help." Scores on the mock tests look superficially more favorable if one simply rescales them to the scale of the full test. For instance, total 55.46 out of 100 on the mock Bridge, if rescaled to be out of 180 (the scale of the real Bridge) appears to correspond to 99.8 out of 180 on the real Bridge, clearly better than the mean of 82.78 for actual real Bridge. However, we shall see later that mock tests are not good predictors of real test scores.

On both real tests, but especially the full TOEIC, it is noticeable that students do a little better on listening than reading. Relative to our students' ability, clearly the level of listening task presented in the real tests presents less of a challenge than that of the reading tasks. Interestingly this pattern of higher scores for listening than reading is repeated across all countries for whom full TOEIC results are reported by the ETS [10]. The mock tests show no such substantial difference however. At the same time, it must be pointed out that the standard deviations are quite high, particularly of the real full TOEIC. This signals a very wide range of ability in the student population. Yet, on the real full TOEIC only 94 test results (=9% of all real full TOEICs taken), were at the 350 target or better, and only 22 (2%) were at 550 (=B1) or better.

TABLE I. OVERALL MEAN SCORES ON EACH TEST.

	Test Types							
	Real full TOEIC		Real Bridge TOEIC		Mock full TOEIC		Mock Bridge TOEIC	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Listening	111.36	80.04	43.74	16.25	29.76	12.00	29.18	9.72
Reading	75.21	68.08	39.04	15.67	29.07	11.92	26.67	9.75
Total	186.06	136.58	82.78	29.55	58.83	21.82	55.46	16.72

Does students' proficiency improve over time as they follow the English courses and are tested twice in each academic year?

The above scores of course are means across students in a variety of different semesters and years of study. Naturally we also wish to know whether, even though the overall scores seem quite low, we can detect progress being made by students measured at different levels of study.

One way of doing this is to compare freshman year scores with those of sophomores, after English teaching input in the freshman year. Table 2 however shows that, on three of the tests, especially the real full TOEIC, freshmen in fact do better than sophomores. Neither year however approach B1 equivalence. Once again, the full TOEIC scores for listening are the best, with A2 equivalence. Only on the mock Bridge TOEIC is there any gain between freshmen and sophomores as groups. Arguably the predominant 'regression' is due to removal of the pressure students are placed under prior to university entry: once they make it into university they see English as less of a source of worry and devote more attention to their major, despite the fact that later they will later have to pass the hurdle of achieving the institutional pass mark on the real TOEIC so as to graduate. For the university, this creates a problem since, as we described earlier, to impress the MOE and the outside world more generally, they need students to be achieving their targets of full TOEIC 350 (non-English majors) or 550 (English majors) as soon as possible and well before graduation.

TABLE II. MEAN SCORES OF FRESHMEN AND SOPHOMORES ON EACH TEST.

		Test Types							
		Real full TOEIC		Real Bridge TOEIC		Mock full TOEIC		Mock Bridge TOEIC	
		Mean	SD	Mean	SD	Mean	SD	Mean	SD
Freshman	Listening	136.31	70.36	44.19	16.78	30.88	13.47	28.08	9.58
	Reading	81.92	71.41	41.58	14.26	30.51	12.83	23.40	10.04
	Total	219.63	129.84	85.79	27.91	61.36	24.46	50.41	16.24
Sophomore	Listening	99.89	82.77	43.04	15.65	27.75	9.21	29.52	9.64
	Reading	73.69	69.43	36.99	16.01	26.71	9.75	28.19	9.10
	Total	172.10	140.92	80.00	29.79	54.48	16.20	57.65	16.58

An alternative, more refined, way of assessing student progress is on a repeated measures basis, considering score change only in specific students who took the same type of test (both parts) more than once in the freshman/sophomore years, however far apart, provided it was not in the same semester. This however proved difficult because it emerged that 69% of all tests taken in full were in fact 'one off', meaning instances where the same person only took that kind of test once. Only 31% was made up of instances where the same person took the same type of test twice, or three, or four times (the maximum possible over two years). The vast majority of multiple instances were of tests taken twice, however: there were only 39 people who took the same type of test 4 times and 217 who did three times.

If we look at this much more limited data, we find that the real full TOEIC was taken twice in both parts in different semesters by just 98 people (and none took it more than twice). Of those, however, only 49, i.e. exactly 50%, showed any score improvement the second time. The other tests however present a more favorable picture. Of the 1367 people who took the real Bridge multiple times, 94.2% showed an improvement between the first and last time they took it. Of the 279 who took the mock full TOEIC multiple times, 80.3% improved, and of the 190 who took the mock Bridge multiple times, 77.4% improved. This could be an indication that students taking the same test multiple times, especially the real Bridge TOEIC, tend to register an increase in scores, in a way that does not happen for the majority who take different tests on different occasions, who dominate the Freshman-Sophomore comparison above. One could speculate that in part this could be due to students becoming familiarized with the test format.

Is there any difference in scores between Departments, and if so, why?

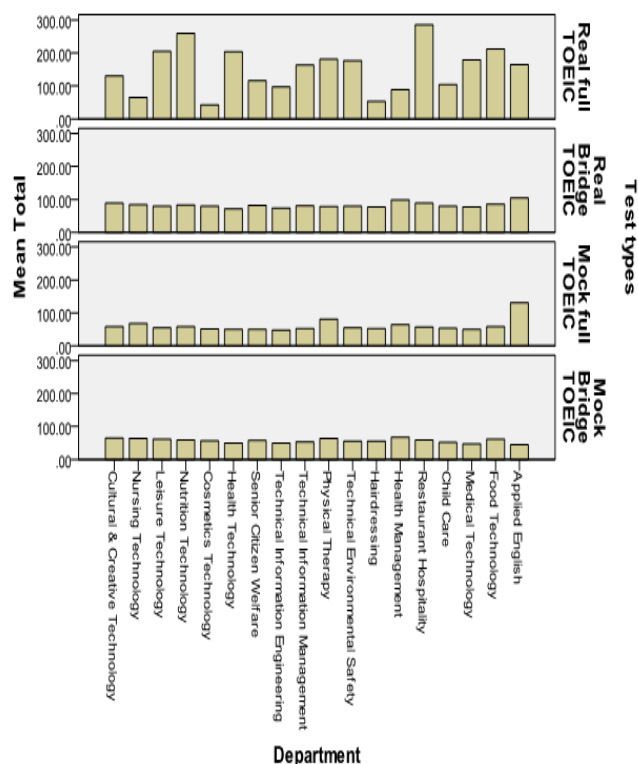
There are some clear differences between departments. However, they are not consistent across all the test types. Applied English, for example, does better than other departments, as one might expect, on real Bridge and mock full TOEIC tests but not on real full TOEIC tests where eight other departments do better (Figure 1). On the other hand, Physical Therapy does reasonably well across all the tests, and this can be explained, for their reading at any rate, from the fact that their textbooks are in difficult medical English and the students have formed a mutual-help reading club to support their reading. Other differences are explicable from additional English teaching which students receive in some departments. Thus, Nutrition and Restaurant Hospitality have their own strong ESP courses and an overseas work experience program. The latter department also employs foreign exchange teachers to teach English and some subject courses. Nevertheless, it must be noted that no department has a mean score on the real full TOEIC that even achieves the lower of the university's target scores (350).

Is testing done too much or too little?

Clearly, if an aim of testing is, as it is in this context, to measure student progression, then every student needs to take the same test at least twice (unless there are robust conversions possible between scores on different tests taken at the different times, see later). Ideally it would be three times: on or soon after arrival, at the end of the 1st year and at the

end of the 2nd year, so as to be able to assess the effects of the teaching/learning in each year.

Fig. 1 Mean total scores by department



Is testing done too much or too little?

Clearly, if an aim of testing is, as it is in this context, to measure student progression, then every student needs to take the same test at least twice (unless there are robust conversions possible between scores on different tests taken at the different times, see later). Ideally it would be three times: on or soon after arrival, at the end of the 1st year and at the end of the 2nd year, so as to be able to assess the effects of the teaching/learning in each year.

If we take the total of different students who completed both reading or listening parts of a test (3311) and the total number of such test protocols of all types that were scored (13,379), then it appears that each student on average took just over four tests in full. That does not mean however that they took the same test four times, as we saw earlier. There were four different types of test and many students took a range of different types of test at different times, though part time evening students took no mock tests, for reasons of lack of time in their schedule.

Table 3 shows a truer picture, recording for each test type how many different students took it in full (both the listening and reading parts), and on average how many times they took that test. As reflected in Figure 1, we can see that the real Bridge TOEIC was taken by the most students, and the most times by those students, though some clearly took it only once. The real full TOEIC was taken by the least number of students, but with the second highest rate of multiple tests taken by the same person. None of the figures even reach an average of twice per student, however, so there is little

evidence that the same test was being taken systematically at different successive times by many of the students. Thus, arguably there was too much testing with different tests, especially of day students, and not enough with the same test repeatedly.

Table III. Numbers of different students taking each test type in full

Test types			Students	Tests	Mean number of tests per student
Real full TOEIC	N		747	1043	1.40
Real Bridge TOEIC	N		3752	6415	1.71
Mock full TOEIC	N		3417	3872	1.13
Mock Bridge TOEIC	N		1736	2049	1.18

How can we convert between Bridge TOEIC scores and Full TOEIC scores?

From our data we obtain through linear regression the formulae:

Real full TOEIC total score = (2.56 x Real Bridge TOEIC total score) - 14

Real Bridge TOEIC total score = (0.134 x real full TOEIC total score) + 53

Our main concern is to be able to predict real full TOEIC scores from real Bridge scores, rather than the reverse, so we focus on the first of the above. A slightly better fit is in fact obtained for that with the power formula below which returns an R squared of .451 in place of .343 from the linear formula.

Real full TOEIC total score = .563 x (Real Bridge TOEIC total score to the power of 1.295)

If our main aim in practice is to predict real full TOEIC scores from real Bridge scores, the formula departs considerably from correspondences in standard tables. For example, a real Bridge TOEIC of 170 (corresponding to B1 level) predicts a full TOEIC score of only 435 on our power formula, not 550 (the correspondence given at [10]). To predict a full TOEIC total of 550 on our formula, a real Bridge total of 204 would be required. In other words, based on a real Bridge score alone our students may appear to be at B1 level, while their likely full TOEIC score would not be up to that equivalence. By contrast, at A1 equivalence, a real Bridge score of 92 in our data predicts a real full TOEIC score of 197 rather than 120 as per [10]. In short, real Bridge TOEIC scores make our students look a little more proficient than the same students' real full TOEIC scores do at the upper end of the score scale and a little less proficient at the lower end.

This discrepancy can be explained in part by the fact that if one wishes to statistically predict a score on one test from a score on another, it is best to use unidirectional conversion formulae, since they can accommodate the fact that correlations are not perfect and hence that the best predictions of corresponding scores differ depending on the direction in which the prediction is being made. Most standard conversion tables such as that at [10] give conversions that are neutral as

to direction so typically represent a compromise between two directional estimations.

## **VII. CONCLUSIONS FROM THE EXPLORATION OF SCORES AND PLAN FOR ACTION WITH AN IEP**

The lack of a clear advantage to full time students who get more time to study, and are tested more often, than part time evening students suggests that the teaching and testing in themselves may be insufficient to promote progress. A factor that needs further consideration in relation to the part time students is the amount and nature of exposure to English, and of need to use English, which they encounter in their day jobs. This could be having a missed effect on motivation or learning or both which is not available to most day students.

The differences between departments attest to the impact of additional English exposure/use which some provide. This takes a variety of forms in different departments - extra English teaching, English medium subject teaching, learner self-help English learning groups, and work experience involving English. All however share the feature that they involve the specialist English of the discipline or the occupation associated with it. Thus, it is English for specific academic or occupational (professional) purposes, ESAP or ESOP, not the English for general occupational/professional purposes, EGOP, which the General English Education course mostly provides. This again may support not only the need for extra English exposure more widely but also the proposal that such provision needs to be specifically relevant to the learner's major and future profession.

There seems to be a clear need for a more rational regime of test administration, done repeatedly with the same type of test at key times, to ensure that time and money is not wasted on rather haphazard testing using different tests on different occasions.

The fact that the mock tests generally are very poor in predicting real test results, and hence not demonstrably useful preparation for them, is salutary, and may prompt either reconsideration of the quality of the mock tests used and the procedures for administering them, or a decision to use only real tests, but in a more sparing and well managed way, at key times only, including on the initial orientation day.

Of the tests used, the real Bridge TOEIC seems to be the best choice for the freshmen and sophomores, since it is shorter and quicker to take, and costs less than the full TOEIC, yet it covers the proficiency span up to B2 which is the institutional target, and its scores can be reasonably confidently equated with full TOEIC scores. It also has the benefit that for relatively low proficiency students it will not involve the demotivating effect that the full TOEIC may have, due to the latter catering for a much wider range of proficiency of taker. That is, in the Bridge, lower proficiency students will not find so many test items that are impossibly hard, and their score will not seem quite so tiny. It is also telling that we found the best progression in students who took the real Bridge multiple times.

Based on the above findings confirming our impression that students' English was not progressing as it should, we further proposed a new intensive English program (IEP) specifically targeting TOEIC skills as the main solution/action to upgrade our university students' general

proficiency, and hence their TOEIC scores. In this way we hoped to promote their capacity for global competitiveness. Indeed this intervention started ahead of the full report on the test scores above, in anticipation of its findings.

## **VIII. OBJECTIVE OF THE IEP ACTION**

As with action research in general, the aim was to test the proposed action by trying it out and seeing if it was successful. In this case success would show itself as a greater increase in TOEIC scores than had previously been recorded.

## **IX. METHOD OF THE IEP ACTION**

The Intensive English Program, launched on campus of Hungkuang University since July 2013, has now been running for five years, additional to the normal English teaching already described. This summer we recruited a class of 49 undergraduate students from thirteen different departments with a view to elevating students' English proficiency from mean 349.8 to 518.3 points (full TOEIC). The IEP was implemented from Monday, July 2, 2018 to Friday, July 27, 2018, thus spanning four weeks. It ran from Monday morning through Friday evening from 8:30am to 6:00pm in 80 minute lessons.

Two textbooks were used on this occasion, including: 30 Days to TOEIC Success, Business Benchmark-Pre-intermediate to Intermediate and BULATS (2nd Edition). These were intended to enhance participants' listening, speaking, reading, writing, pronunciation, vocabulary and grammar skills, with a TOEIC emphasis (see details below).

Each class of students was divided into 3 mini groups and each group competed with another group. The recruited students were motivated and accompanied by peers, TAs, mentors. Indeed, classes were staffed by 1 foreign teacher, 1 local English teacher, 3 teaching assistants and 2 administrative assistants.

Participants were asked to take a pretest of TOEIC two weeks before the intervention. During the intervention, participants were required to take a New TOEIC mock test provided by AMC [12] and ETS [10] every week. Three TOEIC mock test were administered on the first, second and third Wednesdays. The posttest was held on the 4th Wednesday.

In detail, the content of the program involves English for International Communication (EIC), which focuses on Reading and Writing, TOEIC Vocabulary, Speaking and Listening, and Sentence Patterns (SP). Each of these components is described in this section:

### **Reading and Writing (EIC)**

Students learn to improve their reading comprehension and reading speed while practicing such skills as predicting content, skimming, scanning, drawing inferences and conclusions, and guessing meanings of vocabulary from context. Students then respond to the reading material through group discussions and writing in English.

### **TOEIC Vocabulary**

The topics of vocabulary cover transportation, technology, office communication, shopping, travel plans, hotels, recruitment, dining out, events and purchasing. Each

topic introduces 15 commonly used word and phrases in the workplace, which are followed by sentences both in Chinese and English. After the teacher gives instruction, students are paired to practice and ask each other what the meaning of the new word is. Then students do exercises, first, matching the corresponding words, then filling in the blanks with words provided in the box. Each lesson provides dialogue related to the topic for students to fill in the blanks. In addition, students have a chance to test their listening and reading abilities. After class, students were asked to take a mini test on vocabulary Monday through Friday.

#### Speaking and Listening (SL)

The textbook of both EICand SL, Benchmark, is taught by foreign teachers. One foreign teacher teaches Speaking and Writing on a weekly basis to promote students' speaking and writing abilities.

#### Sentence Patterns (SP)

SP offers handouts to students in pairs to guide them how to read and respond to email, advertising, announcements, etc. It combines grammar and tense.

#### E-learning Language Technology (LTC)

In 2017, we adopted the software of I Got and asked students to do 30-item mini mock test at the language lab on Tuesday. The given mock test is divided into 3 levels based on the student level. They also can do extra mock tests at home.

#### Movies

On Wednesday afternoons, we played such films as *The Terminal*, *In Good Company*, *Up in the Air*, *The Devil Wears Prada* and provided test questions related to the films. The films were chosen based on their relatedness to the workplace. Students could gain some understanding about business through fun and the software YoFun, which demonstrated both native language and target language at the same time.

### X. RESULT OF THE IEP ACTION

Not only did students improve their language proficiency, but they were also observed to improve communication skills and interpersonal skills through the program.

With respect to our core interest in proficiency, each year the average improvement score target was set at 120 points, which was achieved in 4 summers out of 5. Even the students in the exceptional summer which did not achieve the expected goal still made an improvement of 95 points. In the year reported here, the participants made progress of 123.5 points on average. Table IV shows that all the participants made significant progress. 27 participants (55%) achieved as much as 500 points. In the listening section, the participants made progress of 129.4 points and, in the reading section, the participants made progress of 117.5 points.

TABLE IV. DESCRIPTIVE STATISTICS RESULTS OF IEP PARTICIPANTS' IMPROVED SCORES

	above 200 points	150-199 points	100-149 points	50-99 points	1-49 points	No progress
Percentage	6.1%	15.8%	15.0%	19.1%	10.9%	0%
Numbers	3	15	12	13	6	0

In addition, a couple of students who had participated in the previous IEP even signed up for this program once more. A 2018 graduate majoring in Applied Cosmetology, achieved 800 points, the highest score in the 2018 IEP, pointing out that when she joined the program as a freshman, her score advanced from 350 to 395 points. As a sophomore, she took classes in the Department of Applied English, joined an exchange program in the United States, continuously improved English competency, aiming to work in foreign companies, so she decided to retake the 2018 IEP as a senior. She encouraged juniors to set learning goals, take interdisciplinary courses, and take advantage of school resources.

However, it was a sophomore majoring in Applied Cosmetology who made the most progress. She said that her English teacher inspired her to join the IEP, but her pretest score was so bad (250 points) that she studied 3 hours on a daily basis in addition to the IEP hours and made progress of 275 points. A third student, majoring in Cultural and Creative Industries, advanced to 630 points by 230 points.

### XI. CONCLUSION

The overall conclusion is that our action was a success: intensive instruction over a relatively short time, which is targeted on the skills required in the test which has to be taken, can have dramatic effects. However, we must note that the IEP was only offered to small numbers of volunteers in each year, who may have been especially motivated. Furthermore, it was quite labor intensive, as well as time intensive, with a high staff-student ratio.

Nevertheless, one action usually leads to another in the cycle of action research [13]. Hence it is our aim now that by delivering the IEP program on an annual basis and extending it to students more widely that English proficiency across the campus can in future be improved up to and even beyond the institutional targets. In this way our research will have made a contribution to our graduates achieving global competitiveness.

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# English adjective order ability by L2 Thai learners

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## Abstract

The objectives of this study are to study the correlation between type of adjective ordering and the competence of L2 Thai learners, and to investigate whether the amount of experience of the language contributes towards the learners' ability to correctly order English adjectives. The subjects were 58 Thai students. They were divided into two groups: English-major and non-English-major. Eight types of adjective order in English were explored (Type 1: condition-age-color-origin, Type 2: opinion-size-color, Type 3: shape-age-origin, Type 4: opinion-shape-color, Type 5: opinion-size-color, Type 6: size-age-origin, Type 7: opinion-age-origin, and Type 8: shape-condition-color). When considering the correlation between types of adjective and competency of L2 learners, the findings showed that in the English-major group, adjective order Type 1 was more difficult than Type 2 and Type 5 whereas in the non-English-major group, adjective order Type 1 was more difficult than Type 2, Type 5, and Type 8. This suggests that the highest number of adjectives in Type 1 is not always difficult than other types. The findings for the second objective showed that, for most adjective order types, the adjective ordering ability of the English-major group was significantly greater than those in the non-English-major group. This suggests that although not always, greater language experience correlate to higher competency in L2 learning. The overall findings also suggest that there is correlation between type of adjective order and language experience in accounting for the performance of adjective ordering in L2.

**Keyword:** adjective, Thai learners, L2 experience

## I. INTRODUCTION

When learning the second language (L2), L2 learners might have difficulty learning grammatical aspects that contradict or do not exist in their L1 [1]. The order of adjectives in English can be complicated for L2 learners as multiple adjectives commonly have to be ordered in the exact way. For example, we have to say, 'white English phone' instead of 'English white phone'. Many studies showed that the order of English adjectives is difficult in L2 English learning for L2 learners [e.g., 2, 3].

This study aims to find out the relationship between type of adjective ordering and the performance of L2 Thai learners, and to explore how language experience in L2 is correlated with the performance of adjective ordering. Even though many aspects of English learning by L2 Thai learners were studied, such as self-efficacy [e.g., 4], sound pronunciation [e.g., 5, 6, 7] and sound perception [e.g., 8, 9], none of them were on the learning of adjective order. This study will be the first study to investigate the performance of the adjective order and the effects of L2 experience and type of adjective orders by L2 Thai learners.

## II. LITERATURE REVIEW

### a. Adjective order in English

The order of adjectives in front of a noun in English seems to be restricted in certain order. According to Chapman [10], prenominal adjectives are generally placed in this order: opinion > size > quality > age > shape > colour > particle forms > origin > material > type > purpose. For example, in the sentence 'a beautiful old Indian carpet', the word 'beautiful' has to precede 'old' as quality has to come before age, and

'old' has to be in front of 'Indian' as age has to come before origin. However, British Council [11] proposed the order of adjectives as follows: general opinion > specific opinion > size > shape > age > colour > nationality > material.

This above placement of size by the British Council seems to be wrong as suggested by Rosato [12] that a phrase 'the nice beautiful big house' is wrong while 'the nice big beautiful house' is correct, according to her opinion as a native speaker of English. She also suggested a modified version for adjective order of British Council as follows: scope-taking (take all adjectives, such as alleged, former, nice) > size > quality > age > shape > color > origin > material. Rosato explained the order of adjectives by dividing prenominal adjectives into three groups: the intransitivity of material and color and the optimisation of cognitive efficiency in the restriction of subsets, age and shape – internally comparative adjectives and internal relativity, and quality and size – externally comparative adjectives and speaker relativity. The first group means the adjectives that are necessary for the noun, such as 'red brick' are necessary for the noun 'house' as the house must be made of something and has some colour. The second group is the adjective that is comparable, such as 'round' and 'old'. We can say 'rounder' and 'older'. The last group is the adjective that is depended on speaker's opinion, such as 'beautiful' and 'interesting'. Hence the first group is the one that is the closest to the noun, followed by the second and the third groups.

### b. Adjective order in Thai

According to Aksornjarung [13], there was no exact rule for adjective order in Thai. If a noun is modified by many adjectives, the prepositions, such as /tʰiː/ 'that', /tɕà:k/ 'from', /kʰɔ̌ːŋ/ 'of', /tʰiː.kāwkǎp/ 'which is about' and /sūŋ/ 'that' are commonly used to link the adjectives and the noun. For

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example:

‘...the broad-shouldered, blue-chinned truck-driver’ [13] is translated to:

kʰon.kʰàp	rót.ban.tʰúk	tʰɿ̌.mǐ.lài.kwǎŋ
driver	truck	that broad-shouldered
kʰǎ.ŋ.kʰǐaw		
blue-chinned		

From the above example, the complementiser /tʰɿ̌:/ ‘that’ is used to link the ‘truck-driver’ and ‘broad-shouldered,’ and ‘blue-chinned’ is used after ‘broad-shouldered’ with no linking word. The number of adjectives in Thai is often less than three words. When there are many adjectives in English, the string of adjectives is divided into phrases in Thai. For example:

‘...Somchai and Somying’s twenty-third wedding anniversary’ [13] is translated to:

ŋǎ.n.kʰóp.rôp	tà̌.ŋ.ŋǎ.n	pǐ..tʰɿ̌.jǰ..sìp.sǎ̌m
anniversary	wedding	year that twenty-third
kʰɔ̌.ŋ.sóm.tɕʰǎ.j.lá̌.sóm.jĩ̌ŋ		
of Somchai and Somying		

In the above example, the ‘wedding’ that modifies ‘anniversary’ has no linking word. However, the ‘twenty-third’ has /tʰɿ̌:/ ‘that’ before the ordinal number, and ‘Somchai and Somying’s’ has /kʰɔ̌.ŋ/ ‘of’ in front of people’s names. This suggests that for some English adjectives, they are changed into noun phrase preceded with preposition in Thai.

### c. Studies on the learning of adjective order by L2 learners

While many previous studies explored the ability of adjective ordering by L2 learners with two adjectives [e.g., 2, 14, 15], only two studies investigated the ability with three or more adjectives [2, 16]. The first study is carried out by Alotaibi and Alotaibi [16]. They investigated the adjective ordering competence by L2 learners with three and four adjectives. In their study, 80 Kuwaiti learners of English were divided into two groups according to their scores on the English proficiency: intermediate and advanced. The test was adopted from Hare and Otto [17]. It contained eight types of adjectives (Type 1: condition-age-color-origin, Type 2: opinion-size-color, Type 3: shape-age-origin, Type 4: opinion-shape-color, Type 5: opinion-size-color, Type 6: size-age-origin, Type 7: opinion-age-origin, and Type 8: shape-condition-color). Each type of adjective order was tested with one item. Type 2 and Type 5 were the same adjectives. The author did not explain the difference between these two. They were merely different in words, i.e. Type 2 was ‘beautiful big white’ whereas Type 5 was ‘wonderful small pink.’ The findings showed that the ability of the advanced learners in ordering the English adjectives was statistically higher than the intermediate ones. Type 1 seemed to be the most difficult type for both groups of L2 Kuwaiti learners due to the lowest percentage as opposed to the other seven types of adjective

ordering. However, no inferential statistics were used to measure the significant differences between the two groups of L2 learners for each type of adjective ordering, nor were inferential statistics used to investigate the effects of type of adjective ordering. The questions of whether the language experience of L2 learners affects the adjective ordering competence for all types of adjective ordering, and whether the type of adjective ordering is correlated to the adjective ordering ability still exist.

The second study is from Endo, Shibuya [2]. In their study, Japanese learners were investigated for their English adjective ordering ability. The learners were divided into three groups, instructed, non-instructed and natural exposure. The task comprised five types of adjectives: shape-material, size-weight, length-color, subjective comment-shape-material, and subjective comment-age-color. The learners responded to the same task twice. The types that are related to our study is the last two types as they are three-adjective order and the effect of L2 experience. The findings of the first execution of the task showed no significant differences among the three groups of the learners, suggesting that they had similar competence in ordering English adjectives. On the second execution, the instructed group had better adjective ordering scores in subjective comment-age-color than the other two groups. However, this study did not apply inferential statistics to compare the competences of the learners towards adjective ordering of subjective comment-shape-material, and subjective comment-age-color.

### d. Studies on language experience and English learning

In L2 research, language experience refers to the experience of the L2 learners in learning the target language. Most previous studies found that the more experience of the target language (L2) the L2 learners have, the more proficient the L2 they become [e.g., 18, 19]. For example, in the study of Flege, Birdsong [19], there were two groups of subjects: Korean children and adults. The children arrived in North America at the age less than ten whereas the adults arrived there at the age over than 20. Based on the rating scores using a 9-point scale of English sentence reading (1 = strongest foreign accent, 9 = no foreign accent), the Korean children in the US had lower score than the Korean adults in the same country suggesting that the children had better pronunciation of English than the adults. This might be due to greater L2 input from native speakers of L2 in the children group than in the adult group as most Korean adults in their study received more L2 input from native speakers of Korean when they lived in Korean before they moved to the US as compared to Korean children.

## III. RESEARCH QUESTIONS AND HYPOTHESES

The research questions and hypotheses are as follows:

1) How does type of adjective ordering relate to the performance of the L2 Thai learners? It is hypothesised that adjective order type 1 will be more difficult than other types of adjective orders for both groups of L2 Thai learners as adjective order type 1 is longer than the other types and as

supported by the study of Alotaibi and Alotaibi [16] that both advanced and intermediate learners had lowest scores of correct answers in the type 1.

2) To what extent does the English-major group benefit from greater language experience in ordering adjectives in front of noun? It is hypothesised that the English-major group will have higher proficiency than the non-English-major group for all types of adjective ordering as shown in many previous studies that L2 proficiency is correlated to L2 experience [e.g., 18, 19].

#### IV. METHODOLOGY

##### a. Subjects

There were 58 subjects in this study. The first group was 28 English-major learners. The other group was 30 non-English-major learners. All learners were in the first year of a university at the time this study was carried out. These learners had intensive background of studying English as a foreign language (EFL) for approximately 15-16 years. The English-major learners were expected to have greater experience and interest in English as they chose English as their major. The non-English-major learners majored in Food Science and Technology; hence they were expected to have less exposure to English. The subjects attended the experiment in exchange for marks in a studying module.

##### b. Test of adjective ordering

The test in this study was adapted from the one used by Alotaibi and Alotaibi [16] who adapted the test used in Hare and Otto [17]. This test was based on the classification of the prenominal adjectives by Svatko (1979) [as cited in 16] who divided prenominal adjective order into eight types as follows: 1) condition – age – colour – origin; 2) opinion – size – colour; 3) shape – age – origin; 4) opinion – shape – colour; 5) opinion – size – colour; 6) size – age – origin; 7) opinion – age – origin; and 8) shape – condition – colour. Please note that Type 2 was similar to Type 5. In the study of Alotaibi and Alotaibi [16], the performance of L2 learners for each type of adjective order was measured with only one sentence. However, in this study, the proficiency of each type of adjective order by L2 learners was explored using three sentences. This test was proofread by three native speakers of English who were university lecturers in Thailand. After the proofreading, the sentences for each type of adjective order were randomised by the number from the random function in Excel. This results in the set of sentences for each type as follows: sentences 9, 4 and 15 were for Type 1; sentences 10, 22 and 18 were for Type 2; sentences 7, 17 and 9 were for Type 3; sentences 16, 21 and 20 were for Type 4; sentences 12, 11 and 24 were for Type 5; sentences 23, 19 and 3 were for Type 6; sentences 5, 6 and 1 were for Type 7; and sentences 8, 13 and 14 were for Type 8.

##### c. Data collection

The subjects were tested in a lecture room at the university. Each group was in separated rooms at different time. The subjects were isolated as in an exam scenario, i.e. no

one sat next to each other. Before they did the test, they signed the consent form. They could withdraw from the research participation at any time. At the time of the test, they were told the purpose of the test and instructed how it should be carried out, in their native language, Thai, to minimise the language barrier. The test took approximately 25-40 minutes.

##### d. Data analysis

The data were entered into Excel file. The descriptive statistics of the performance of the adjective order for each type by each group of the subjects was presented in percentage, mean, standard deviation (*SD*), maximum and minimum. Then to investigate the effects of the language experience of the L2 learners and the type of adjective order, a linear mixed model (LMM) was run using the *lme4* package in R statistical software [20]. The dependent variable was the score out of three (as there were three sentences for each type), and the independent variables were type of adjective order (Type 1-Type 8) and language experience of the L2 learners (English-major and non-English-major). There is the repetition of the subjects as each of them did all types of adjectives; the subject was fitted as random intercept of the model. To select the best model, the model with the interaction of two variables was compared with the model with two variables separately with the *anova* function in R. The best model was selected from the smaller Akaike Information criterion (AIC) following the study of Kitikanan [6]. It was found that the best model was the model with interaction of two variables. Then to see all pairs of contrasts for the score of adjective order, Tukey's HSD post-hoc test was performed using *lsmeans* package in R statistical software [21]. The output from the post-hoc test provided us with the comparisons of when the performances of the two groups of subjects were compared based on each type of adjective order, and when the performances of each type of adjective order were compared in each group of subjects.

#### V. RESULTS

The descriptive statistics showed that overall, the adjective ordering scores of the English-major students were higher than those of the non-English-major ones in all types of adjective order, except Type 8. Regarding the adjective ordering scores for each group, English-major students had the highest scores of adjective ordering in type 5, followed by type 2, type 4, type 6, type 7, type 1, type 3 and type 8. In the non-English-major group, their scores of adjective ordering were highest in type 5, followed by type 2, type 8, type 4, type 6, type 7, type 3, and type 1. The details of these statistics can be seen in Table 1.

##### a. Research question 1: How does type of adjective ordering relate to the performance of the L2 Thai learners?

When the performances of the adjective ordering in the same group of learners were compared, it was found that for the English-major learners, their performance in adjective ordering Type 1 was significantly lower than those in adjective ordering type 2 ( $b = -0.75$ ,  $SE = 0.19$ ,  $df = 406$ ,  $t = -.88$ ,  $p < 0.05$ ) and Type 5 ( $b = -0.79$ ,  $SE = 0.19$ ,  $df = 406$ ,  $t = -$

4.06,  $p < 0.01$ ); their performance in adjective ordering Type 2 was significantly higher than those in adjective ordering Type 3 ( $b = 1.14$ ,  $SE = 0.19$ ,  $df = 406$ ,  $t = 5.91$ ,  $p < 0.01$ ), Type 7 ( $b = 0.71$ ,  $SE = 0.19$ ,  $df = 406$ ,  $t = 3.69$ ,  $p < 0.05$ ) and Type 8 ( $b = 1.36$ ,  $SE = 0.19$ ,  $df = 406$ ,  $t = 7.01$ ,  $p < 0.01$ ); their performance in adjective ordering Type 3 was significantly lower than those in adjective ordering Type 4 ( $b = -0.96$ ,  $SE = 0.19$ ,  $df = 406$ ,  $t = -4.98$ ,  $p < 0.01$ ), Type 5 ( $b = -1.18$ ,  $SE = 0.19$ ,  $df = 406$ ,  $t = -6.09$ ,  $p < 0.01$ ) and Type 6 ( $b = -0.82$ ,  $SE = 0.19$ ,  $df = 406$ ,  $t = -4.24$ ,  $p < 0.01$ ); their performance in adjective ordering Type 4 was significantly higher than that in adjective ordering Type 8 ( $b = 1.18$ ,  $SE = 0.19$ ,  $df = 406$ ,  $t = 6.09$ ,  $p < 0.01$ ); their performance in adjective ordering Type 5 was significantly higher than those in adjective ordering Type 7 ( $b = 0.75$ ,  $SE = 0.19$ ,  $df = 406$ ,  $t = 3.88$ ,  $p < 0.05$ ) and Type 8 ( $b = 1.39$ ,  $SE = 0.19$ ,  $df = 406$ ,  $t = 7.20$ ,  $p < 0.01$ ); their performance in adjective ordering Type 6 was significantly higher than that in adjective ordering Type 8 ( $b = 1.04$ ,  $SE = 0.19$ ,  $df = 406$ ,  $t = 5.35$ ,  $p < 0.01$ ). The findings that adjective order Type 1 was more difficult than Type 2 and Type 5, and that adjective order Type 6 was easier than Type 8 are consistent with the percentage findings of both advanced and intermediate learners in the study of Alotaibi and Alotaibi [16]. However other significant findings are contrastive to the percentage findings of advanced learners in the study of Alotaibi and Alotaibi [16]. This might be due to the difference in linguistic backgrounds of this study and their study, i.e. the L2 learners in this study were Thai whereas those in their study were Kuwaiti.

For the non-English-major learners, their performance in adjective ordering Type 1 was significantly lower than those in adjective ordering Type 2 ( $b = -0.77$ ,  $SE = 0.19$ ,  $df = 406$ ,  $t = -4.1$ ,  $p < 0.01$ ), Type 5 ( $b = -0.8$ ,  $SE = 0.19$ ,  $df = 406$ ,  $t = -4.28$ ,  $p < 0.01$ ) and Type 8 ( $b = -0.67$ ,  $SE = 0.19$ ,  $df = 406$ ,  $t = -3.57$ ,  $p < 0.05$ ). For the other contrasts of each pair for each type of adjective ordering, there was no significant difference ( $p > 0.05$  for all other contrasts). These findings suggest that for the non-English-major group, the order of adjectives before the noun for Type 1 was more difficult than those for Type 2, Type 5 and Type 8. Moreover, the higher variability of the significant differences between types of adjective ordering in the English-major group, as opposed to the non-English-major group also suggests that the type of adjective ordering has larger effect on the performance of the English-major group than the non-English-major one. The findings that adjective order Type 1 was more difficult than Type 2, Type 5 and Type 8 in the English-major group were in agreement with the percentage findings in the study of Alotaibi and Alotaibi [16] suggesting that the number of adjectives to be ordered affects the ability in ordering adjectives.

According to the first hypothesis, the adjective order Type 1 would be more difficult than other types of adjective orders for both groups of L2 Thai learners. This hypothesis is partially confirmed – the findings that support this hypothesis are 1) in the English-major group, the score of adjective ordering Type 1 was significantly lower than Type 2 and Type 5; and 2) in the non-English-major group, the score of

adjective ordering type 1 was significantly lower than Type 2, Type 5 and Type 8.

TABLE 1. TYPE OF COMPETENCE FOR EACH THE ADJECTIVE ORDER IN L2 THAI LEARNERS OF THE DIVIDED BY THE MAJOR, ADJECTIVE ORDER

MAJOR	TYPE OF ADJ ORDER	%	M	SD	MAX	MIN
ENG	Type 1: condition – age – colour – origin	40.48	1.21	1.03	3.00	0.00
	Type 2: opinion – size – colour	65.48	1.96	1.17	3.00	0.00
	Type 3: shape – age – origin	27.38	0.82	1.06	3.00	0.00
	Type 4: opinion – shape – colour	59.52	1.79	1.17	3.00	0.00
	Type 5: opinion – size – colour	66.67	2.00	1.05	3.00	0.00
	Type 6: size – age – origin	54.76	1.64	0.87	3.00	0.00
	Type 7: opinion – age – origin	41.67	1.25	1.08	3.00	0.00
	Type 8: shape – condition – colour	20.24	0.61	0.63	2.00	0.00
NON-ENG	Type 1: condition – age – colour – origin	6.67	0.20	0.48	2.00	0.00
	Type 2: opinion – size – colour	32.22	0.97	1.00	3.00	0.00
	Type 3: shape – age – origin	13.33	0.40	0.67	2.00	0.00
	Type 4: opinion – shape – colour	23.33	0.70	0.88	3.00	0.00
	Type 5: opinion – size – colour	33.33	1.00	1.02	3.00	0.00
	Type 6: size – age – origin	20.00	0.60	0.67	2.00	0.00
	Type 7: opinion – age – origin	16.67	0.50	0.63	2.00	0.00
	Type 8: shape – condition – colour	28.89	0.87	0.78	3.00	0.00

NOTE: The mean scores based on the raw data and LMM output were similar. They are shown in 'M' column.

*b. Research question 2: To what extent does the English-major group benefit from higher language experience in ordering adjectives in front of noun?*

When comparing the performance of the English-major and the non-English-major groups for each type of adjective order, it was found that the performance of the English-major learners in ordering adjectives in front of noun was significantly higher than that of the non-English-major in Type 1 ( $b = 0.01$ ,  $SE = 0.23$ ,  $df = 256.92$ ,  $t = 4.33$ ,  $p < 0.01$ ), Type 2 ( $b = 1.00$ ,  $SE = 0.23$ ,  $df = 256.92$ ,  $t = 4.26$ ,  $p < 0.01$ ), Type 4 ( $b = 1.09$ ,  $SE = 0.23$ ,  $df = 256.92$ ,  $t = 4.63$ ,  $p < 0.01$ ), Type 5 ( $b = 1.00$ ,  $SE = 0.23$ ,  $df = 256.92$ ,  $t = 4.27$ ,  $p < 0.01$ ) and Type 6 ( $b = 1.04$ ,  $SE = 0.23$ ,  $df = 256.92$ ,  $t = 4.46$ ,  $p < 0.01$ ). This suggests that the language experience is positively correlated to adjective ordering ability in Type 1, Type 2, Type 4, Type 5 and Type 6. There was no significant difference in the scores of these two groups in the ordering of adjectives in Type 3, Type 7 and Type 8 ( $p > 0.05$  for all contrasts).

Based on the second hypothesis, the proficiency of all types of adjective ordering would be higher in the English-major group than the non-English-major group. This hypothesis is also mostly true as the English-major group benefited from their greater experience in Type 1, Type 2, Type 4, Type 5 and Type 6. These findings are also consistent with the study of Alotaibi and Alotaibi [16] that greater experience of the language helps the L2 learners in ordering English adjectives. The results from LMM can be seen from Figure 1.

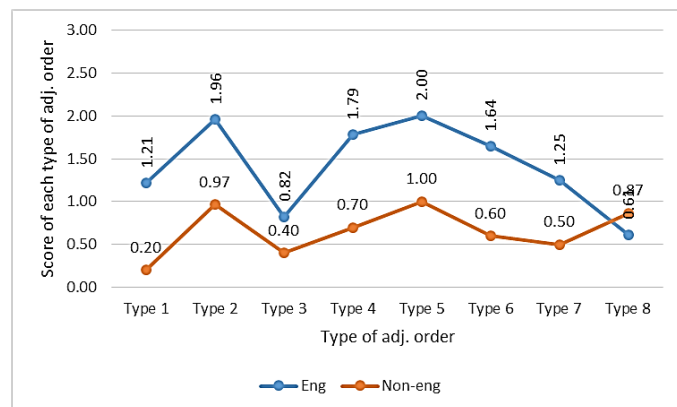


Fig. 1. The average proficiency scores of each type of adjective order by English-major and non-English-major learners, according to LMM. The scores of English-major group are shown in vertical direction while those of the non-English-major group are in horizontal direction.

## VI. CONCLUSION

In terms of type of adjectives, the results of this study showed in the English-major group, adjective order type 1 was more difficult than Type 2 and Type 5 whereas in the non-English-major group, adjective order Type 1 was more difficult than Type 2, Type 5, and Type 8. They also showed that adjective order Type 1 was not more difficult than the rest of adjective orders for both groups. This suggests that the length of adjectives does not always cause difficulty as predicted. Regarding the language experience of L2 Thai learners, although it was found that the ability in ordering adjectives in English-major group was significantly higher than that in the non-English-major group in most types of adjective order, there were some other types (Type 3, Type 7, Type 8) where there were no significant differences between these two groups. This suggests that these three types are easy to learn, or the L2 learners might have acquired their ability from their early stage of L2 learning. The findings also suggest the correlation between language experience and type of adjective order. It is not surprising that we did not find the differences in the adjective ordering ability in Type 2 and Type 5 as they were similar in adjective order. This confirmed that our test was valid.

For further research, the responses of adjective order by L2 learners might be analysed to see whether there is the effect of L1 transfer. In this study, the effect of L1 transfer has not been considered to account for the findings. The analysis was carried out based on binary response, i.e. either correct or incorrect. If the order of adjectives by L2 learners is

considered together with the order of the Thai translation for these English adjective orders, the findings might suggest the effect of the native language towards the target language learning.

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# Do L2 experience, type of affix and motivational factors relate to affix knowledge in L2 English learning?

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## Abstract

It is well-established that the knowledge of affix helps with communication in second language (L2). There is no study, however, on the relationship between affix knowledge and motivation, and affix knowledge and L2 experience despite motivation and L2 experience are essential in the L2 learning. In addition to this, studies on the relationship between affix knowledge and type of affixes is rare. The aims of this study are therefore to explore the relationship between: 1) L2 experience and affix knowledge; 2) type of affixes and affix knowledge; and 3) motivation and affix knowledge. The subjects were Thai university students. They were divided into two groups: high- experience and low-experience. The high-experience group were English-major students whereas the other group were students majoring in Food Sciences and Technology. Their affix knowledge was tested with a test consisting of 13 items to test prefix knowledge and 16 items to test suffix knowledge. Their motivation was tested in four aspects: ideal L2 self, ought-to L2 self, L2 learning experience and L2 anxiety. The findings showed a positive correlation between the L2 experience and affix knowledge. The high-experience group obtained a higher percentage in the test for both types of affix than the low-experience group. For the second aim, the results showed that the low-experience group had significantly higher knowledge of prefix than suffix. No significant difference was found in the prefix knowledge and suffix knowledge in the high-experienced group. This suggests that type of affix is correlated to affix knowledge in the low-experience group but not in the high experience group. The results also show that motivation did not significantly correlate to affix knowledge for both types of affix. These findings suggest that the L2 experience plays a big role in English affix learning. The implication of this study is that English teachers should provide studying materials and examples that allow the L2 learners to enhance their level of affix knowledge.

**Keyword:** affix, English, language experience, motivation

## 1. INTRODUCTION

Affix refers to an additional element that is placed either in front of (prefix) or after (suffix) a root or word. English is one of the languages that has affix, both prefix and suffix. For example, the prefix 'micro-' (small) can be placed in front of words, such as 'microscope,' 'microcomputer,' and 'microelectronic' to indicate that that object is small. The prefix changes the meaning of the word, such as 'anti-' and 'dis-' whereas suffix often changes part of speech, such as '-ment' and '-ly.' In the L2 instruction, the affix is often one part to be learned. The learning of affix in L2 can help the second language (L2) learners to extend the vocabulary size which will enhance the ability to communicate. The L2 learners with higher affix knowledge have higher proficiency in L2, such as in vocabulary [e.g., 1], and speaking [e.g., 2] than those with lower affix knowledge.

Many studies have explored factors affecting L2 performance. In regard to motivation and L2 experience, these two factors were well-known to improve the L2 learning. Language experience was found to be positively correlated to knowledge in L2 learning as supported by many studies [e.g., 3, 4, 5]. For example, in the study of Kitikanan [4], high-experienced subjects were better at perceiving the differences between English /d/ and Thai /d/ in the low vowel context, and English /ð/ and Thai /d/ in the high vowel context than the low-experienced ones. Regarding the relationship between motivation and affix knowledge, and the study on the correlation between L2 experience and affix knowledge, no

previous study on these topics has been carried out despite these two factors playing a big role in L2 learning success [6]. This study is the first study on these topics. Regarding the study on the relationship between affix knowledge and type of affix, literature on this topic is rare. Only one study by Mochizuki and Aizawa [1] was found; however, no inferential statistics were used to see whether these two factors were significantly correlated. Understanding of the relationship between affix knowledge and type of affix, affix knowledge and motivation, and affix knowledge and L2 experience might increase the effectiveness in teaching and learning L2 affix.

Thus, the aims of this study are as follows: 1) to find out whether there was relationship between L2 experience and affix knowledge; 2) to explore the correlation between type of affix and affix knowledge; and 3) to examine the relationship between affix knowledge and motivation. There are five motivational factors in this study: ideal L2 self, ought-to L2 self, L2 learning experience, intended effort and L2 anxiety. Three motivational factors were developed by Dörnyei [7]. They are ideal L2 self, ought-to L2 self and L2 learning experience. The ideal L2 self is the hope of becoming successful in terms of career. The ought-to L2 self is an effort to learn L2 to avoid negative outcomes. The L2 learning experience refers to learning factors, such as peer group and curriculum. L2 anxiety is added to explore the anxiety of the L2 learners in learning English.

For directional hypotheses, in the relationship between affix knowledge and L2 experience, it was expected that the affix knowledge, both prefix and affix, would be positively

correlated to L2 experience. This hypothesis was developed from the results that showed positive correlation between language experience and L2 performance [e.g., 3, 4, 5]. Regarding the hypothesis for the relationship between type of affix and affix knowledge, it was hypothesised that the knowledge of suffix would be higher than that of prefix following the finding in the study of Mochizuki and Aizawa [1]. For the relationship between motivation and affix knowledge, following the study of Kitikanan [8], it was hypothesised that ideal L2 self, ought-to L2 self, L2 learning experience and intended effort would be positively correlated to affix knowledge while L2 anxiety would be negatively correlated to affix knowledge.

## II. THE STUDIES OF AFFIX KNOWLEDGE AS L2

It is relatively well established that affix knowledge can increase the size of vocabulary in L2 learners. However, while there are many studies on L2 vocabulary size [e.g., 9, 10, 11], the number of studies on affix knowledge in L2 in particular is smaller [e.g., 1, 12]. For example, Schmitt and Meara [12] explored the change of word associations and suffix knowledge over time. The subjects were Japanese students. They were high school students and university students. The results showed that the subjects had poor knowledge of suffixes suggesting the need to improve kinds of word knowledge and promote the learning of suffix. They also showed a weak relationship between suffix knowledge and word association. However, this study did not examine the knowledge of prefix in L2 learners. The study of affix knowledge in the L2 learning has received interest since in 1990s. There are a number of studies on this topic. For example, in the study of Mochizuki and Aizawa [1], the relationship between vocabulary size in L2 and the affix knowledge of the learners, and the order of affix acquisition were investigated. The subjects were Japanese high-school and university students. The vocabulary size was measured by a vocabulary level test whereas affix knowledge was measured with an affix test which was composed of the test of prefix and suffix. The subjects were divided according to their vocabulary size: over 2,000, over 3,000, over 4,000 and over 5,000 words. The descriptive statistics showed that the level of affix knowledge was positively correlated to the size of vocabulary. For the second aim, the findings showed that L2 Japanese learners acquired the following order of prefixes: 're-', 'un-', 'pre-', 'non-', 'anti-', 'semi-', 'ex-', 'en-', 'post-', 'inter-', 'counter-', 'in-', and 'ante-'. For the order of suffix acquisition, the orders were from first to last as follows: '-ation', '-ful', '-ment', '-ist', '-er', '-ize', '-al', '-ly', '-ous', '-ness', '-ism', '-able', '-less', '-ish', '-y', and '-ity'. The correlation coefficients of prefixes and suffixes are high suggesting that the rank of acquisition of these two affixes were correlated to the vocabulary size. This can imply that the acquisition order of L2 English affix was reliable. The findings of this study suggest that the vocabulary size is expanded when the L2 learners acquire affix.

## III. METHODOLOGY

### a. Subjects

The subjects in this study were divided into two groups: high-experienced and low-experienced. The first group was 28 English-major students and the second group was 30 non-English-major students. The major of the second group was Food Science and Technology. All subjects were in their first year at the time this research study was conducted. For English-major group, there was an English morphology and syntax module but it was in their second year; hence they had not had English affix training. The English-major group represented a high-experienced group whereas the non-English-major group represented a low-experienced group. All subjects were Thai students who had been exposed to English as a foreign language (EFL) for almost 20 years suggesting that they mainly used English in English classroom.

### b. Research instruments

There are two research tools in this study: the test of affix and the questionnaire for motivational factors. The details of each tool are as follows.

#### 1) Test of affix

The test was adapted from the study of Mochizuki and Aizawa [1]. It was composed of two parts: prefix and suffix. The prefix part comprised 13 items whereas there were 16 items in the suffix part. The numbers of items in each part were the same as the original test. In the prefix test, there were three made-up words for each item, and each of them were preceded by an English prefix. The subjects had to choose one answer out of four alternatives for the meaning of the prefix. In this part, in the original test, the alternatives were in the first language of the L2 learners; however, our subjects were provided with two languages, i.e. Thai and English to minimise language barriers and widen the chance of choosing a correct answer, in case that the L2 learners remembered the meaning in L2. The consistency of the Thai and English alternatives for the prefix part were proofread by three English lecturers of a university who were Thai but who were proficient in both languages.

For the suffix part, similar to the prefix part, there were three made-up words in each item, and the subjects had to tell the part of speech for the words with the suffix. The alternatives were noun, verb, adjective and adverb. All directions for the two parts were in the first language of the subjects. The target prefixes and suffixes were underlined in the test.

#### 2) Questionnaire

The questionnaire to explore motivational factors in this study was from the study of Papi [13]. It was developed based on the L2 Motivational Self System by Dörnyei [7] which comprises of three components: ideal L2 self, ought-to L2 self and L2 learning experience. The L2 anxiety and intended effort were added to examine more aspects of motivation, resulting in five motivational aspects. Each aspect was measured with six questions or statements and based on six-point Likert scale. The rating was ranked from 'strongly



disagree' which was represented by '1' to 'strongly agree' which was represented by '6.' The Thai and English versions of statements and questions were provided to minimise English barriers for L2 Thai learners. The translation was proofread by three Thai speakers who were university lecturers teaching English.

#### c. Data collection

Each group of subjects sat in separate rooms at different times. They were told to sit as if they were having an exam; hence, none of them had their peers sitting on their immediate left or right. The first researcher explained to the subjects the purpose of the test in Thai. Before the test, they signed their name on the consent form. The test took approximately 35-40 minutes, then the motivational questionnaire was distributed to the subjects. The total process took around an hour. Participation of the subjects was voluntary, and they were allowed to cancel the participation at any time. The ethical approval of this study was obtained from Naresuan University Institutional Review Board (COA No. 362/2018 and IRB No. 0539/61).

#### d. Data analysis

As the numbers of items for each type of affix in the test were not the same, to compare the affix knowledge for each type, the numbers of correct identification were transferred into percentage. The total number of items for suffix was 16 while that for prefix was 13. Hence, the number of correct identification of suffix for each participant was divided by 16 and multiplied by 100 whereas that of prefix was divided by 13 and multiplied by 100.

For the motivational factors, the internal reliability of each motivation was calculated by the use of Cronbach's alpha in *Rcmdr* package in R [14]. According to Dörnyei [15], the threshold for L2 research is 0.7, the internal reliabilities of all motivational aspects, except ought-to L2 self were higher than 0.80. For the ought-to L2 self, the alpha reliability was 0.67; however, the model suggested that this value would be increased to 0.73 when item 8 was deleted. Hence, item 8 was deleted from this motivational aspect. Then the rating for all items for each motivational aspect were combined and divided by the number of items (five for ought-to L2 self and six for other aspects). The descriptive data was presented in mean and standard deviation (*SD*).

To investigate factors that were correlated to affix knowledge, a linear mixed model (LMM) was run in the *lme4* package in R [16]. The independent variables were type of affix (prefix, suffix), L2 experience of the L2 learners (high-experienced, low-experienced), motivational factors (ideal L2 self, ought-to L2 self, English learning experience, intended effort, English anxiety). The first two variables were categorical whereas the motivational factors were continuous. The dependent variable was the percentage of correct identification for the affix knowledge. As subjects had answered for both types of affix, the subject was fitted as a random intercept. The first model was run with no interaction between independent variables. The second model was run with only interaction between type of affix and experience of

the L2 learners, and motivational factors with no interaction. After using *ANOVA* function to assess which model fit the data better, the second model was significantly better than the first model ( $p > 0.01$ ). The third model with interaction between type of affix and experience of the L2 learners – no motivational factors was run, and compare with *ANOVA* function. There was no significant different between the second and the third models ( $p > 0.05$ ). The model with simpler formula, i.e. the third model, was used to generate the inferential result. The means and standard errors (*SE*) of the interaction between type of affix and each major of the L2 learners were calculated by Tukey's HSD post-hoc test by the *emmeans* package in R [17].

## IV. RESULTS AND DISCUSSION

The descriptive statistics show that the high-experienced group had higher levels of ideal L2 self, English learning experience and intended effort than the low-experienced group. However, the low-experienced group had higher levels of ought-to L2 self and English anxiety than the high-experienced group. Regarding the percentage of correct identification for each type of affix, the high-experienced group had higher ability of affix for both prefix and suffix than the low-experienced group. Additionally, although suffix ability was higher than that of prefix in the high-experienced group, the pattern was opposite in the low-experienced group. The means and *SDs* for the motivational factors and affix knowledge by two groups of the L2 learners can be seen in Table 1.

TABLE I. THE MEANS AND *SDS* FOR THE MOTIVATIONAL FACTORS AND AFFIX KNOWLEDGE BY THE EXPERIENCE OF THE L2 THAI LEARNERS

	High-experienced		Low-experienced		Total Score
	Mean	SD	Mean	SD	
<b>Ideal L2 self</b>	3.80	0.74	3.42	0.76	6
<b>Ought-to L2 self</b>	2.34	0.89	3.32	0.68	
<b>English learning experience</b>	3.74	0.59	3.14	0.64	
<b>Intended effort</b>	4.01	0.50	3.28	0.67	
<b>English anxiety</b>	2.36	0.82	3.44	0.79	100%
<b>Type: Prefix</b>	75.55	13.08	39.23	15.56	
<b>Type: Suffix</b>	77.68	15.72	26.88	11.15	

#### a. The relationship between affix knowledge and L2 experience

Regarding the comparison of when the type of affix, and experience of the L2 learners are similar, Tukey's HSD post-hoc test based on the third LMM shows that first, for both types of affix, the affix knowledge was significantly higher in high-experienced than low-experienced groups ( $b = 36.32$ ,  $SE = 3.68$ ,  $df = 111.81$ ,  $t = 9.88$ ,  $p < 0.01$  for prefix;  $b = 50.80$ ,  $SE = 3.68$ ,  $df = 111.81$ ,  $t = 13.82$ ,  $p < 0.01$  for suffix) suggesting

that language experience does play a role in the knowledge of affix. These findings support many studies on the importance of L2 experience on the L2 proficiency [e.g., 3, 4, 5], and they also support the hypothesis of the positive correlation between L2 experience and affix knowledge. Figure 1 shows the boxplot of the percentage for the correct identification of the affix according to the type of affix and experience of the L2 learners, based on the third LMM.

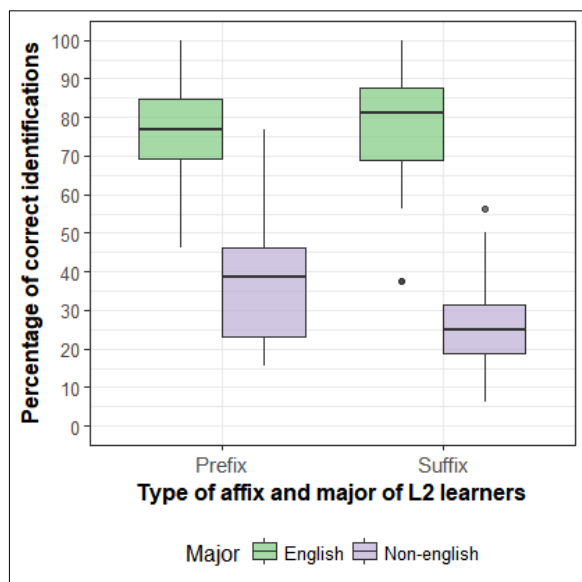


Fig. 1. Boxplot representing percentage of the correct identification according to types of affix and experience of the L2 learners (high-experienced group is 'English' whereas low-experienced group is 'Non-english'), based on the third LMM.

#### b. The relationship between type of affixes and affix knowledge

Regarding the relationship between type of affixes and affix knowledge, in the low-experienced group, affix knowledge was significantly higher for prefix than suffix ( $b = 12.36$ ,  $SE = 3.08$ ,  $df = 60.07$ ,  $t = 4.01$ ,  $p < 0.01$ ). This finding seems to be contrastive to the study of Mochizuki and Aizawa [1] where suffix knowledge was higher than prefix knowledge regardless of the vocabulary size of the subjects. It might be due to the differences in teaching and studying materials between Thai and Japanese learners. It might be that the focus of the teaching in affix and vocabulary in Japan is on suffix rather than prefix, or the number of examples of the suffix in Japanese textbooks for English teaching might be greater than that of the prefix. In Thailand, the pattern might be opposite. For this exploration, future research might be carried out. However, the finding in the study of Mochizuki and Aizawa [1] might actually be that prefix knowledge is not significantly different from suffix knowledge. The findings of this study cannot be directly compared to the findings of that study as there are no inferential statistics to compare the two types of affix in that study. For affix knowledge of both types of affix in the high-experienced group, no significant difference was found ( $p > 0.05$ ). The findings of our study suggests that learners with low L2 experience are good at affix knowledge

when the affix is prefix, rather than when it is suffix, but for the learners with high L2 experience, the type of affix does not play a role.

#### c. The correlation between affix knowledge and motivation

The model comparison between the second and the third model shows that none of the motivational factors were significantly related to the affix ability ( $p > 0.05$  from ANOVA function). It signifies that motivational factors do not affect the affix knowledge of the L2 learners. This means that none of the hypotheses on the relationship between affix knowledge and motivation are supported. These findings are in contrast to many studies which found relationships between motivation and L2 proficiency [e.g., 18, 19]. This might be due to the questionnaire that was used to investigate L2 motivation. As the motivation test can be designed in many ways, the motivation test in this study might not reveal the L2 motivation that is related to affix knowledge. Also, it is possible that L2 affix performance is not driven by motivation in L2 learning as shown by the findings in this study.

## V. CONCLUSION

The overall findings of this study show that the affix knowledge was correlated to the L2 experience rather than motivation in L2 learning. This implies that to improve the proficiency of the L2 affix, teachers should provide more examples and a wider list of affixes to L2 learners so that they can get exposed to the L2 affix input. Affix knowledge was also related to type of affixes in the low-experienced group. As the scores of the prefix and suffix in the high-experienced group was not significantly different from one another, and the means of affix knowledge were over than 75% for both affixes, it suggests that their knowledge of affix in English is high before they receive morphology training. Hence, in the training, teachers should teach L2 learners with high experience L2 affixes which might not occur frequently or difficult ones, rather than teaching general affixes. However, for low-experienced learners, as the findings showed that they had less than 40% accuracy rate for both types of affix, teachers might provide them rich examples and various affixes so that their experience of affixes in English will be greater.

For the limitations in this study, first, the definition of the low-experienced group refers to the non-English-major subjects who were students of Food Science and Technology majors. This definition might not be applicable if the students are in some other majors in health sciences, such as the medical and dental schools, as many of them are as good at English as much as English-major students. If the affix knowledge of students in English-major and health-sciences-major was compared, there might be no significant difference in their ability. The other limitation is the number of prefix and suffix. There were only 13 items to test prefix knowledge and 16 items to test suffix knowledge. In fact, the number of these two types of affix in English is much higher than this. It is possible that the test does not measure the affix knowledge of the affixes the L2 learners knows. The percentage of correct answers of both groups might be higher when there are more

and various items to test. For future research, the L2 learners of other linguistic backgrounds might be investigated for the relationships between affix knowledge and motivation, affix knowledge and type of affix, and affix knowledge and L2 experience to see whether the result supports this study.

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## ESP course design in EFL classroom

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### Abstract

English for specific purposes, also known as ESP, emerged due to the demand of English for used in scientific and economic work. In addition to this, linguists started to explore how language was used in real communications and realized the virtue of learner-centered instruction. ESP is defined as a course in which the aims and the content are determined by the functional and practical English language requirements of the learners. Consequently, need analysis is required in order to determine course content, objectives, materials, teaching methodology and assessment. A Business English Course design was used as a case study.

**Keyword:** ESP, course design, Business English

### I. INTRODUCTION

ESP, English for specific purposes, was introduced because of the demands of New World after World War II. During that time English was used as a medium language because of the expansion of scientific and economic activities. In the early 1970s, the western money and knowledge flowed into the oil-rich countries, thus English had to be used as a bridge to communicate for daily life and trading. Another reason, ESP merged from a revolution in linguistics that means linguists explored how language was used in a real communication and English for Science and Technology (EST) blossomed. And also those linguists had realized that the learning of students was of different needs and interests acquiring language learner-centered instruction. From those two reasons, the linguistics attempted to create a course which serves students' needs with specific purposes.

ESP courses are those in which the aims and the content are determined, principally or wholly, not by criteria of general education (as when English is a foreign language subject in school) by the functional and practical English language requirements of the learners. Within ESP, a crucial distinction exists between courses of English for Science and Technology (EST) and all others courses. EST courses are usually distinct because they require incorporation within them of greater content of "scientific English". This in turn entails the learning of ways in which quantification of various kinds is expressed in English, the control of the "international" vocabulary of scientific stems and affixes as they operate in English, and the selection of communication purposes special to science and technology.

Now ESP and EST are indeed too general. EST, a field of ESP, can be divided in terms of field of study, e.g. English in Workshop Practice, English in Basic Medical Science, or English in Biological Science. ESP can now be recognized according to the nature of the purpose involved as English for Academic Purposes (EAP) and English for Vocational or Occupational Purposes (EOP). English—EAP, EST or EOP—are included in other academic study e.g. law, economics,

mass communication, etc.

However, many scholars proposed the nature and characteristics of ESP course in many aspects such as, Hadley[1] stated that the key to teaching ESP is to focus on the "S" for specific, which means specialized language and practice. However, the word "special" might imply to special language or special needs or aim. Dudley-Evans & St. John[2] stated that the ESP course should be designed to meet learners' specific needs. The methodology and activities of the course should be related to the target disciplines. Besides, language, skills, discourse and genres also should be suited for the activities. Additionally, EAP and EOP should be integrated in the 4 skills into the course design which needed for students meaningful learning and to meet specific needs of them. Regarding the introduction of Handbook of English for Specific Purposes[3], a key feature of an ESP course is the content and aims of the course which are oriented to the specific needs of the learners. Therefore, in accordance with Dudley-Evans & St. John, key issues in teaching ESP are "how to identify learner's needs, the nature of the genres that learners need to be able to produce as well as participate in, and how teachers can know that learners have been able to do it successfully, and, if not, what the teachers can do to help"[3]. Dudley-Evans & St. John[cited in [4] also asserted that ESP courses are likely designed for adult learners and, may be, EFL Learners. Likewise ESP courses may be planned for beginners as well as students with intermediate or advanced skills.

In this article, ESP course development was reviewed in the following process from need analysis, material selection, methodology, and assessment and evaluation. The Business English course for EFL university learners was referred as the case study.

### II. ESP COURSE DEVELOPMENT

#### A. Need Analysis

Needs analysis is the crucial first stage in ESP course development, even for producing material and developing the

test. It refers to the process of determining needs. Terms and concepts of needs analysis vary from researchers to researchers. Hyland[5] broadly defined needs analysis as “the techniques for collecting and assessing information relevant to course design: it is the means of establishing the how and what of a course.” Correspondingly, Hutchinson and Waters[6] also associated needs analysis with the term target situation needs which tells what people do with the language and learning needs which tells how people learn to do what they do with language. They also refer to the sub-division of needs in terms of necessities, lacks and wants—necessities being what the learner has to know to function effectively in the target situation, lacks being the information that the researcher needs to know about the learner’s previous knowledge to predict what they lack, and lastly, wants being a subjective idea of what the learners need to know. Robinson[7] introduced three concepts and terms to needs analysis: target situation analysis, present situation analysis (PSA) and the language audit. Target situation analysis or TSA refers to form of needs analysis which focuses on identifying learners’ language requirements in the occupational or academic setting [8]. TSA may determine the stage of ‘good enough’ language competence for the job[9]. Present situation analysis or PSA, on the other hand, estimates learners’ strength and weakness in language, skill and experience. The course developers may establish PSA from students themselves, instructors, and graduate users, including surrounding society and culture[9]. Lastly, the language audit is a combination of TSA and PSA. It was stated as examination of foreign language needs in a large-scale—company, region or country level [9]. There are three processes of the language audit that are used to plot the role played by foreign language in a commercial or industrial enterprise. Firstly, a target profile of language skills in the determination of particular language skills needs to perform in specific jobs. Second, a profile of present ability is the extent to which personnel match up to the job’s English requirements. Third, the auditor must determine how much language training is needed to bridge any gap between the employees’ present ability profile and the company’s target profile.

Robinson[7] also reviewed various pieces of work on needs analysis and listed five types of needs:

1. Needs can refer to students’ study or job requirements; that is, what they have to be able to do at the end of their language course. This is a goal-oriented definition of needs.
2. Needs can mean what the user institution or society – primarily regards as necessary or desirable to be learned from a program of language instruction.
3. Needs can mean what the learner needs to do to actually acquire the language. This is a process-oriented definition of needs and relates to transitional behavior, the means of learning.
4. Needs can refer to what the students themselves would like to gain from a language course. This view of needs implied that the students may have personal aims in addition to (or even in opposition to) the requirements of their studies or jobs. Such personal needs may be devalued by being viewed as ‘wants’ or ‘desires’.

5. Needs can be interpreted as ‘lacks’; that is, what the students do not know or cannot do in English.

The idea of needs has been interpreted differently by different researchers depending on their adopted theoretical framework or ideological preconceptions. This would likely lead to different sets of needs. In conclusion, needs analysis will be the starting point in determining the learner’s needs in terms of level, aims, objectives, content, teaching methodology, and course materials for ESP. Need analysis framework for ESP should be flexible with consideration of different point of view from learners, subject-specialists, English language instructors, and graduate users.

### *B. Material Selection*

As mentioned earlier materials are one of the starting points in determining the aims as a source of language and a learning support. The other aim of materials should motivate and stimulate the students to be fun during class activities and also motivate them to use real language for learning. Then the writers or providers of the of the course’s material had to be well organized for references which need to be completed and also must be used by learners with different characters and learning styles. In addition, writers or providers should select and create materials from what is available then, modify activities to suit learners ‘needs. The most important point of materials that students should be participating and suggesting (their own ideas) is how these materials suit their different abilities and learning styles. Besides, materials should be flexible to use and not to follow the text all the time. For ESP course, Dudley Evans [4] proposed that authentic material is an appropriate choice for advanced or intermediated learners. Authentic material means using material from the main area of study of learners or their occupation, which is not developed or written for teaching purpose. This material includes books, forms, charts, graphs etc. that may be used in modified or unmodified forms according to requirement of teaching circumstances [4]. Moreover, in the age of technology and social media where it offers the possibility of alternative materials and classroom interactions, such as audio & video cassettes, Computer-Assisted-Language Learning (CALL), CD-ROM, social media (e.g. Facebook, YouTube, Twitter, etc.), and online applications (e.g. Kahoot, Socrative, Quizlet, etc.). Finally, writers or providers should be designing and creating materials which will challenge students to develop their ability to be genius learners.

### *C. Methodology*

ESP methodology is the next point to be considered and designed to suit students’ needs. There are many modals of integrated skills approaches to provide for students as follows; content-based instruction, theme-based instruction, experiential learning, episode hypothesis and task-based instruction. Why do we have to integrate teaching methodology; we experienced those were not the perfect methodology to suit the students’ needs and abilities and another reason was that productive and receptive skills should go together. Thus, the writers or providers have to know the needs of the students before designing the course and integrate the methodology to be done with the perfect course to use for

students and then they can reflect the whole language approaches to instruction.

#### *D. Assessment*

Assessment in ESP is the last point to be mentioned but it has many basic concepts to consider as follows; a practicality of the test such as the test can provide for a large number of students, easy to administer and interpret e.g. percentile rank. The second concept of the test is reliability; background knowledge of students should be considered to design the test and not allowing candidates too much freedom with the test. Enough behavior sampling of candidates could make the test more reliable. Test validity is the next concept to mention because test measure what it is intended to measure such as, content and the scope of the test should be specified and measured. Authenticity was the next concepts to be considered because they can reflect what the test contain natural and authentic language. Washback is the concept that it could be used its results and advantages of it to develop the test more effectively and useful. Besides, the basic concepts for ESP testing as mentioned, how to device a test of ESP also pointed out. The following are the steps to design how a good test of ESP, the course designer had to set the goal of a test which needed to be cleared and specified. Secondly, the course designer did the need analysis by interview to see the authenticity, and also studies from the old materials. The observation of actual negotiating sessions and business meetings is one of the good ways to devise a test of ESP. Next, did a tape record participants' use of English in the various situations and then, limit the scope and content of the test needed. Some of teachers write the test at this stage which it does not gain enough information to do that because the teachers have to try out the new test with another group of students and then, revise the test based on limitations and the suggestions from the try out process. Finally, the students will be done doing authentic testing, reflected their real-life and also their real performances.

All mentioned were the theoretical and concepts to give knowledge to course designers and providers. ESP is not a new course and also was introduced since World War II with its aim to serve the learners' needs, especially, EFL and ESL learners who are the largest proportion of non-native speakers in expanding circle[10]. Since they are not native thus, their purposes and styles of learning and using English also differ. Especially, the old teaching for EFL and ESL learners which are always based on native strategies and texts which made the learners difficult to understand and cannot learn effectively. Moreover, the knowledge that students gained could not be applied in their daily life and works. Therefore, ESP course could serve students' needs for many purposes and trained to be specialized in the areas that they lacked and also fulfilled their experiences. The teachers who responded to design and teach ESP course on their own should try to improve students' skills by adding additional integration skills exercises relevant to their particular students' needs. Class activities should generally focus on relevant, up- to-date topics of interest to students. These should also relate to their common experience, which can motivate them to learn best. Because the differences of students, cultural awareness was found to be one of the most important aspects of teaching ESP course.

Without this awareness much miscommunication could result. Ellis & Johnson[11] showed that cultural understanding is essential in maintaining and not damaging relationships.

### **III. BUSINESS ENGLISH COURSE DESIGN**

Business English was one of ESP course which used English for communication since the purpose of English for business communication is based on the communicative functions which determine the features of language use. The increasing attention that has been given to business English along with business communication is well documented. The trend in English for specific purposes is toward the business context[2]. Business English exhibits strong interest in the field of communication[12]. Recent developments in business English focus on such areas as meetings, presentations, and negotiations, areas which are frequently addressed in communication skills[11]. Therefore, business communication has become the focus of increasing interest, particularly in business studies as well as in ESP. In order to communicate, however, thresholds of business vocabulary, which help students to understand well enough when they read business texts, should be encouraged. Wenhua Hsu[13] accordingly indicated that higher vocabulary levels and larger vocabulary size can help students read the business texts effectively.

Business English is an ESP course designed for Bachelor of Business Administration students of Nakhon Pathom Rajabhat University, Thailand. It is a compulsory course for those majoring in general management, finance and banking, logistics management, marketing, business computer, international business, human resource management, and accounting. The idea is to familiar student with English in business context. Normally students take business English course after finishing general English courses, assumedly in their second year of study. At the time, their English skills is expected to be in intermediate level, better enough for ESP learning, as well as they start learning major subjects and be able to understand the business contents.

In designing the course, Functional/Notional by Hutchinson and Walters[6] was applied as theoretical framework. In a notional-functional syllabus, instruction is not organized in terms of grammatical structure, as had often been done with audio-lingual method (ALM), but instead in terms of 'notions' and 'functions'. Proponents of the notional-functional syllabus helping students develop their ability to effectively communicate in variety of real-life context[16]. Communicative function was focused together with business terminology in the course objectives. Consequently, the students are expected to develop their business vocabularies and expressions throughout the course; and apply them to 4 skill-communications in various business contexts, starting from socialization to negotiation.

The materials used area commercial textbook and selected authentic business documents. The authentic texts are chosen to familiarize students with the use of business English in real contexts, which are limited for EFL students. Current relevant news and trends are also highlighted to link students with their specialized field. Audio files and video clips are

used as pronunciation model, as well as learning about business culture. In the textbook, there is a culture session which students can learn together with communication practices. Class activities mostly focused on students; lectures are only for introduction at the very first weeks of the course. Regarding task-based learning, students practice responding to email, and writing memos. Through the course, students are assigned to practice communication in pair and in group. After that, they are asked to do role-play conversation in business situations, e.g. making appointment, business interviewing, etc. Moreover, at the end of the course, students do a project about company profile and product presentation. According to assessment methods, performance test is referred. The students are evaluated through their behaviors in class, e.g. writing assignment, group work, and role-play with small emphasis on written exams.

TABLE I. BUSINESS ENGLISH COURSE DESIGN COMPONENTS

COMPONENTS	BUSINESS ENGLISH
Theoretical Framework	Functional/Notional by Hutchison and Walters[3]
Course Objectives	<ul style="list-style-type: none"> <li>• Understanding the definition of business vocabulary and expressions in various business area</li> <li>• Applying business vocabulary and expressions in various business situations appropriately</li> <li>• Communicating by using language use in various business situations</li> <li>• Writing short compositions in business area (e.g. memos, email, etc.)</li> </ul>
Methodology	Task-based, project based
Materials	Text (authentic & adapted), audio files, Internet & social media, online applications, realistic situations
Activities	Lecture, individual/pair/group work, class discussion, role-play
Assessment	<ul style="list-style-type: none"> <li>• Performance test               <ul style="list-style-type: none"> <li>- Writing email and memos</li> <li>- Presentation</li> <li>- Role-play</li> </ul> </li> </ul>

#### IV. CONCLUSION

In conclusion, before designing ESP course, the course designer has to consult representative of as many relevant groups of stakeholders as possible including students, English instructors, subject specialists and employers or sponsors. The course developers have to realize language skills learners are expected to have for their job, students' current level of English, and students' weaknesses that need improvement, including current trends of the field. To design Business English course, the course designers should realize that global business needs to focus on itself and should develop its own theories, research methods traditions of scholarship, and overarching intellectual goals[14]. Only when these factors are taken into considerations, then more effective ESP course will result.

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# Authentic assessment, What and why authentic assessment

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## Abstract

Authentic assessments have often been considered productive as tools for increasing student engagement, learning, and confidence. There are two particular forms of student assessments that have been employed in modern classrooms. These are self-evaluation and student portfolios. They can be seen as useful authentic assessments tools when used in certain capacities. In this article, the authors focus on the use of authentic assessments by instructors in the classroom. They specifically discuss the use of self-assessment and portfolios to enhance student learning, creativity, confidence, purposes of assessment and people who involved in assessment.

**Keyword:** authentic/alternative assessment, self- assessment, portfolio

## I. INTRODUCTION

As a language teacher, you may question how your students learn and how much progress they have made. Many teachers may say that they can obtain this information from the students' test scores received from standardized tests or from their formative and summative test scores. If you were a traditional teacher, you may agree with this idea because the tests are reliable and can assess the students' progress through traditional test types such as multiple choices. However, some scholars argued that those types of test are not challenging tasks to elicit higher order thinking and show learning processes as well as learning outcomes, and that only one type of test cannot assess many aspects of students' performance.

Shepard (1990s-2000) proposes that "a classroom assessment should be an on-going processes, integrated with instruction, used formatively in support of students learning, expected visible to students, students active in evaluating their own work and also used to evaluate teaching as well as students learning" (p.8). Thus, you can see that in the process of assessing, the teacher has to assess the students' performance in many aspects and motivate them to take part in as assessors to evaluate their own tasks. We should not rely on traditional forms of test and use only one form of test as we may not be able to assess and cannot judge students' authentic performance. In my viewpoint, the traditional test types are not realistic. For example, when using multiple-choice test to assess students' speaking ability, the students have no chance to perform and assess their own speaking ability, but are limited to do paper test in which the content are not related to their background knowledge or represents realistic speaking situations in their daily lives. In my opinion, using multiple-choice test to assess speaking ability is indirect assessment which does not represent the actual speaking performance of students and cannot reflect how students learn and make progress.

To solve these problems, O'Malley (1996) has raised her idea and seeks the new forms of assessment to measure students' achievement which are closely similar to

instructional activities in classrooms. Authentic assessment or another term alternative assessment refers to "multiple forms of assessment that reflect students learning, achievement, motivation, and attitudes on instructionally-relevant classroom activities" (O'Malley & Pierce, 1996, p.4). There are various forms of the assessment such as performance assessment, portfolio assessment, and self- assessment.

From the previous paragraph, you can infer that for authentic assessment the assessors can create their own test which is similar to their classroom activities such as speaking test. As a teacher for Communication Course, I noticed that most students can do the test well when I assign them to create their own topic or brainstorm for the conversation. On the other hand when I specify the topic for the test, they cannot do it well and they lack creativity and speak unnaturally. It might be insisted that the students do not like unfamiliar topics and the topics I assign are not close to their realistic lives, thus they may not perform their actual performance. Because authentic assessment is a direct assessment, the test results can tell you about the progress of learners and their achievements. Besides, the test activities are related to their real lives. For example, when they do a role play about eating out, Thai students like to order their local and favorite dishes. This behavior reflects their culture and their identity. But sometimes they didn't know how to call some Thai dishes, for instance, some kinds of juice. For the previous issue, I assigned my students to find out those kinds of juice and present to their friends. This helped them learn more from their peers and by themselves and can present many kinds of juice such as guava juice, tamarind juice and others which they are familiar and have seen in their daily lives. In this case, when the students perform their abilities, the teacher can assess their progress without using a paper test. Furthermore, the students themselves can evaluate their own tasks and learn their progress at the same time. We might insist that these types of assessment also encourage the students to learn and find out their own learning strategies successfully and practically.

Here, we come to the answer of the question "why

should the teacher use authentic assessment instead of the traditional assessment?" The answer is because it can assess the full range of essential student outcomes (O'Malley & Pierce, 1996). The reason of using this type of assessment is that the teacher can gain a clear picture of students' skills and abilities and how students learn and improve (Resnick & Klopfer, 1989). From the two cases of the scholars' conclusion, I strongly agreed with these two ideas. In case of O'Malley & Pierce, the students learn the lesson by themselves and take part as a test writer, thus it can assure the teacher that their outcomes will represent their own authentic performance. The another case of Resnick & Klopfer (1989) is when the test scores matched with their performance, teachers can observe them in classroom to motivate and facilitate their learning. The students then will use their knowledge to function effectively in real life situations and also apply to use it in various situations to serve their needs and purposes.

In conclusion, authentic assessment is a direct assessment which can assess the real performance, creativity and progress of students' learning. Besides, it is the integration of learning and assessing which the students are not forced to do the unrealistic test that cannot assess their authentic performances.

Although it takes time for practicing and assessing by authentic assessment, this type of assessment can reflect the students' voice to the teachers and encourage them to develop their progress of learning by doing. Therefore, the teacher has to ask yourself before integrating it with your teaching. Also, you should be an opened-minded teacher ready to assess your students' achievement with the test that the students take part in developing, and to turn your role to the facilitator as well.

## II. ALTERNATIVE ASSESSMENT, SELF-ASSESSMENT, PORTFOLIO

In this journal, I begin each paragraph with a brief summary of different issues I have learnt from the readings, lecturer and discussion leader. Then I share my own opinion and experience as a language teacher and test writer. At present, teachers' responsibilities are not merely teaching but also office works dealing with documents and other duties. Many institutions have a policy to admit large numbers of the students as a result teachers have to work heavily. The following utterances are the ones we are quite familiar with "I cannot correct all the assignments" I don't have time to give them feedback on their tasks" Because of the limitation of time, teachers cannot complete checking all the tasks they assigned, students never get the way to improve their language skills and develop learning abilities. To solve these problems, many scholars have attempted to create assessment techniques to help teachers and students in learning improvement and reach the achievement. Self-assessment is one of assessment types that can serve for these purposes as it can save teachers' time and encourage students to make judgment about their own work. Self-assessment can allow students to identify their own strength and weakness and they may use their strengths and weaknesses as the guidelines to improve and develop their work and study.

In fact, self-assessment is not a very new type of assessment. Jean Piaget has first used it since 1990 in the U.S. He developed it based on Constructivist Theory (Sri sa-ard,

2011). Later, this theory was supported by psychologists, Vygostky Bruner and John Gardner. Because of its important role in teaching and learning, I was very keen to discuss self-assessment and share my viewpoints in some aspects. Firstly, I discuss the meaning of self-assessment defined by different theorists. Klenowski (1995) defined self-assessment as "the evaluation or judgment of the worth of one's performance and the identification of one's strengths and weaknesses with a view to improving one's learning outcomes." Besides, Boud (1995) defines self-assessment as "the explanation to the standard or criteria to assess the practicing and the decision making whether the students can go to those criteria or not." In short, self-assessment is the process that students evaluate or make decisions whether they can pass the criteria specified by the teacher and reflect their own performance, including recognizing their strengths, weaknesses, and ways for improvement. The term of 'self-assessment' has the same meaning with other terms such as self-evaluation, self-assessing, and self-report.

The second point I discuss concerns some advantages of using self-assessment. The first advantage is that this type of assessment encourages learners to take responsibility for their own assessing. As Ross (2006) points out self-assessment is the technique which allows students to take part in setting the criteria on which their work is to be rated and help they get engaged more in assessment tasks. Secondly, it offers opportunities for learners to reflect their language skills and performance on the tasks and recognize strengths and weaknesses. Besides, the most important advantage is that self-assessment supports learner-centered language teaching and self-regulated language learning. The information students obtain from doing self-assessment and guide them how to minimize their weak points and improve their performance for the next tasks. As Naeni (2011) points out self-assessment of learning skills has impacts on the improvement of the learners' outcomes. I strongly agree with Naeni (2011) because in my opinion, educational development has to focus on learners' self-improvement at the first stage. Self-improvement is the hearted of learning (Bond & Falchikov, 1989 and Bond 1995).

However, in my opinion, self-assessment may not be successfully used in Thai context. With the nature of Thai learning cultures in which the students follow all of teachers' commands when performing tasks, students may not be allowed to take part in assessing and not encouraged to be creative learners. Besides, it may get worse when the results from self-assessment and teacher's assessment mismatch, and when the teacher does not give student clarification by providing feedback of their performance. In addition, some students may not be motivated or feel uncomfortable to do self-assessment because they do not get used to it. Thus they may overestimate or underestimate themselves and this can lead to unreliable information on students' performance. In other words, information from self-assessment may not represent the real performance and abilities of students. Additionally, most teachers often do not pay attention on information from self-assessment; thus, they lack information on some aspects such as students' effort. They focus only on grading students based on their own criteria; as a result, the students lack understanding on their own performance and

insights for improving themselves and cannot achieve the aims of learning. As Ross (2006) suggests self-assessment provides insight information that is difficult to assess such as students effort on the task. When the students create and do their interesting tasks by themselves, they could learn and try to adjust their outcomes for the next tasks. They might review and learn more with their own assessment and more often that they prefer and also stay with them proudly. Therefore, we can claim that self-assessment is a valuable tool that can support the learning outcomes of our students and a valid of assessment reform (Aschbacher,1991;Newman,1997; Wiggins 1993; 1998).

Another point I have learned concerns self-assessment tools that are accepted and widely used to assess students' improvement. There are 6 types; rating scale, portfolios, checklist, journal, open-ended questionnaire and scoring rubrics (Sri sa-ard, 2011). Portfolio is one of familiarized and widely used tools for evaluating the learning of learners' abilities in Thai situation. Portfolio is a collection of experience development, knowledge, and conceptual. It could be group or individual work. Students can use it as a consideration of their skills, progresses, achievement, and the change of attitudes (Ruaentrakul.A&Dumrongpanich. S, 2008).Valencia (1990) explains that portfolio is a systematic collection of student work that is analyzed to show progress over time with regard to instructional objectives and it involves students' selecting samples of their own work to show their growth of learning over time. To support Valencia's explanation, in Thai educational system, many schools admit the students with outstanding abilities to join the "Gifted Project" by assessing students' abilities from their portfolio. These schools always use portfolio as one of a tool checking their progress and growth of learning because they consider that they should not judge students' achievement only from the admission test result and interview. Thus, the teachers have to encourage students to see the importance of portfolio and give them a clear direction on how to evaluate themselves. From my experience, the students intend to collect their work and be happy with it, especially pieces of work with positive comments from the teachers. Students often show their works to their parents and others family member.

In my opinion, portfolio is a self -assessment tool that is practical for evaluating the students' improvement, progress, and achievement; thus, the teachers should promote students to use it appropriately and effectively. However, in Thai situation, self- assessment can lead to misinterpretation when the assessors are not honest and have a less understanding of its good practices. It is still the teachers' responsibility to train the students employing it effectively and appropriately.

### III. CONCLUSION

In conclusion, it is evident that authentic assessments and more specifically student portfolios can be effective tools to encourage student self-evaluation, reflection, and critical thinking. Portfolios allow educators to evaluate student performance and progress based on authentic samples of student work, this importantly allows students to share the responsibility for setting learning goals and evaluating progress toward meeting those goals (Scherba de Valenzuela, 2002). Although portfolios can provide important

opportunities for self-reflection, interpersonal interaction, and student autonomy, teachers are often weary of implementing portfolio initiatives due to the perception that portfolios require excessive time and resources that may interfere with other instructional activities. Teachers need to carefully consider their willingness to commit to a portfolio initiative before implementation

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# Influencing factors for study master's degree of Nakhon Pathom Rajabhat University students

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## Abstract

The purposes of this research were 1) to compare the differences in personal factors for the demand for studying master's degree of Nakhon Pathom Rajabhat University students and 2) to study influencing factors for studying master's degree of Nakhon Pathom Rajabhat University students. 400 samples of the study were selected from the fourth-year and fifth-year students at Nakhon Pathom Rajabhat University through quota sampling. The statistics used for analyzing data were calculation of the percentage, arithmetic mean, standard deviation, t-test, variance, and multi-step regression analysis.

The results indicated that 1) the demand for studying master's degree of Nakhon Pathom Rajabhat University students was different according to their grade point average but found no differences in gender and faculty and 2) the influencing factors for studying master's degree of Nakhon Pathom Rajabhat University students were environmental factors (X3) family factors (X2) and personal factors (X1). An equation was created to predict a student's interest in studying a master's degree at Nakhon Pathom Rajabhat University was produced. This was  $Y = 1.18 + 0.20 X_1 + 0.21 X_2 + 0.30 X_3$  and for the sample studied it had the predictive power of 44.80%.

**Keyword:** higher education, master's degree, Nakhon Pathom Rajabhat University

## I. INTROUCTION

Education develops people, and people develop nations; As in all developed countries education is an important strategy to bring sustainability to the country. Education is a necessity and one of human needs which enables people seeking more knowledge to be able to keep up with the fast-changing world. Higher education helps students to develop their knowledge and specialties which can then be deployed for doing to work more effectively in the workforce [1].

There has been an increase in the number of universities with graduate schools. This is the case for both public and private universities. There is a presumption that graduate level education can create good career opportunities and is widely accepted by society [2]. The main purpose of this level of education is to focus on further developing people with potential, knowledge, and ability. This is so that they can develop themselves and the country in a rapidly expanding economy. From such a situation, it is necessary to focus on the future trends of the Thai education system to produce more skilled workers to serve the labor market. Presently, Thailand is faced with rapidly changing economic, social, political, energy and environmental situations. This change is more severe than ever before. Therefore, Thai higher education needs to be modified quickly to support and respond to these rapid changes. It is also required to enhance the sustainable development of the nation by strengthening the immunity in the country under the philosophy of Sufficiency Economy. The education system must also promote the development of the country to be competitive in the ASEAN community and the global context [3].

Nakhon Pathom Rajabhat University (NPRU) was established in 1936. The university produces quality graduates to serve society. It has been declared as the best Rajabhat University in Thailand and is ranked 23rd nationwide [4]. At

the master's degree level, NPRU has 5 programs on offer. These are educational administration, curriculum and instruction, general management, physics, and computer education [5].

This research started from the observations of the authors who teach management at both undergraduate and graduate. We observed that the Master's students mostly came from other universities. We thought it would be interesting to find out the influencing factors that lead to NPRU students pursuing higher education at NPRU. The results from this study could be used as a guideline for involving agents in the university to develop and revise curriculum to meet the demand and attract students to study at Nakhon Pathom Rajabhat University.

### A. Research Objectives

1. To compare the differences in personal factors for the demand for studying master's degree of Nakhon Pathom Rajabhat University students.

2. To study influencing factors for studying master's degree of Nakhon Pathom Rajabhat University students.

### B. Research Hypotheses

H1. The demands of NPRU students for studying at master's degree level are different according to personal factors.

H2. Family factors, personal factors, and environmental factors influenced Nakhon Pathom Rajabhat University students in their decisions to study master's degrees.

## II. RESEARCH FRAMEWORK

From the literature review and related research, such as Pavita KanKate [2] Phanphanat Janha and Atchariya Prabaripai [3] Kriengsak Sangchan [6] Aphorn Chiawchankaset [7] Assacha Boonchaiyah [8] Warisara Duangtanoi [9] Suchawadee Kingthong and Tienkaew Liemsuwan [10] the conceptual framework can be summarized as follows.

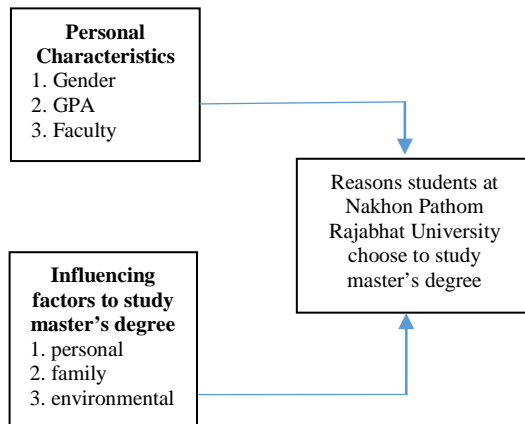


Fig. 1. Conceptual framework

### III. RESEARCH METHODOLOGY

#### A. Population and sample size

The survey population was fourth-year and fifth-year students at Nakhon Pathom Rajabhat University who were interested in studying master's degrees. The sample size was calculated using the formula of Cochran [11], It contained 385 sets in total. Quota random sampling was used in order to obtain a balanced proportion of the population from NPRU during the 2017 fiscal year. [12].

TABLE I. SAMPLE SIZE

Faculty	Population	Sample
Education	712	57
Humanities & Social Science	1,724	139
Science & Technology	1,327	107
Management Science	951	77
Nursing	63	5
<b>Total</b>	<b>4,777</b>	<b>385</b>

NB. The fourth-year and fifth-year students were from Faculty of Education, Faculty of Humanities & Social Science, and Faculty of Science & Technology.

#### B. Research Instrument

A questionnaire was used to collect data in this research. This was constructed by the researchers through the theoretical concepts, related research, and the research conceptual framework. The data collected by the questionnaire could be divided into 2 parts.

Part 1: Questions relating to the personal characteristics of the respondents. This included gender, GPA, faculty, and pursuing master's degree (at NPRU or elsewhere as a dummy variable). The questions were closed-ended and were presented in the format of check-lists.

Part 2: Questions on relating to the influencing factors for studying a master's degree. This was a set of closed-ended questions containing check lists and a 5 point Likert scale.

The questionnaire was verified for validity and reliability using Cronbach's [13] The result was 0.81-0.84.

### IV. RESEARCH RESULTS

TABLE II. PERSONAL CHARACTERISTICS

	Variables	Percentage
Gender	Male	32.75
	Female	67.25
GPA	Less than 2.00	4.75
	2.00 – 2.50	47.50
	2.51 – 3.00	35.25
	3.01 – 3.50	10.25
	3.51 up	2.25
Faculty	Education	14.90
	Humanities & Social Science	36.09
	Science & Technology	27.78
	Management Science	19.91
	Nursing	1.32
Pursuing master's degree	Yes	25.25
	No	74.75

The results showed that most of the respondents were females (67.25%).The majority of respondents had a GPA 2.00-2.50 (47.50%).The majority were currently studying Humanities & Social Science (36.09%), The majority of respondents had already decided not to pursue a master's degree (74.75%)

TABLE III. INFLUENCING FACTORS TO STUDY MASTER'S DEGREE

Questions	Mean	SD.
Having basic knowledge of selected study	3.32	0.73
Using knowledge for career-wise	3.39	0.97
Self-improvement	3.60	0.96
<b>Personal Factors</b>	<b>3.43</b>	<b>0.76</b>
Being supportive for study master's degree	3.11	0.96
Expenditure readiness	3.17	0.93
<b>Family Factors</b>	<b>3.14</b>	<b>0.88</b>
Interesting public relations from the universities	3.07	0.83
Interesting curriculum	3.14	0.86
Convenience to travel	3.28	0.87
<b>Environmental Factors</b>	<b>3.16</b>	<b>0.74</b>

The results showed that all factors have influence on a student's decision to study a master's degree. The researchers assigned dummy variables as interest in study at NPRU = 1

and study elsewhere = 2. The results were shown in table 4 and 5.

TABLE IV. DECISION TO STUDY MASTER'S DEGREE AT NAKHON PATHOM RAJABHAT UNIVERSITY

Independent Variables	t/F	sig
Gender	1.59	0.11
GPA	13.91	<0.01**
Faculty	1.72	0.09

The results revealed that the decision on study master's degree at NPRU was different with statistical significance in terms of GPA.

TABLE V. INFLUENCING FACTORS TO STUDY MASTER'S DEGREE OF NAKHON PATHOM RAJABHAT UNIVERSITY

Factors	B	SE.	Beta	t	sig	VIF
(Constant)	1.18	0.28	-	4.20	0.00	-
Personal	0.20	0.07	0.22	2.95	0.00	1.25
Family	0.21	0.09	0.23	2.35	0.02	2.17
Environmental	0.30	0.08	0.35	3.63	0.00	2.17

R = 0.669

R<sup>2</sup> = 0.448

The analysis showed that VIF did not exceed 0.4.

The results showed that the largest influencing factors for student's deciding to study master's degree were environmental factors ( $X_3$ ), family factors ( $X_2$ ), and personal factors ( $X_1$ ) respectively. The equation for NPRU students deciding to study master's degrees of was  $(Y) = 1.18 + 0.20 X_1 + 0.21 X_2 + 0.30 X_3$  It had the predictive power of 44.80%.

## V. CONCLUSION DISCUSSION AND SUGGESTIONS

The results demonstrated that

1) Gender did not have any statistically significant influence on a student's decision to study master's degree. This finding was consistent with a study of Warisara Duangtanoi [9], The highest demand for graduate study in the field of accounting. This indicated that different genders and backgrounds did not have any effects on further study. This finding was consistent with a studies by Warisara Duangtanoi [9], Aphorn Chiawchankaset [7] and Suchawadee Kingthong [10] who also found that gender was not a factor. The research indicated that male and female students decided to pursue further education.

2) Gender did not have any influences statistically significant on study master's degree, which contradicted with Suchawadee Kingthong and Tienkaew Liemsuwan [10] which pointed out that faculty did have an impact on students from social science at Burapha university on pursuing master's degree. That found that gender had influences statistically significant on study master's degree.

3) The demand of NPRU students for studying master's degrees varied depending on the student's GPA. This finding was consistent with Pavita KanKate [2]

4) Influencing factors that related NPRU student's decision to study master's degrees were environmental factors. This finding was consistent with a study of Kriengsak Sangchan [6] who found that factors, lecturers, curriculum, image, and the university's administration were key factors.

5) Family factors and personal factors were also found to be important. These were consistent with a study of Assacha Boonchaiyah [10], which showed that students were motivated by the people surrounding them.

### A. Policy Suggestions

1) The results revealed that GPA influenced decision-making to study master's degree at Nakhon Pathom Rajabhat University, The courses must therefore be interesting and appropriate to the target group who usually will tend to study in their original majors when choosing a Master's program. If the program does not meet the needs of the students, they will choose to go other universities.

2) The results indicated that personal factors, family factors, and environmental factors; all have influence in the student's decision making process when they are deciding to study master's degree at NPRU. To be precise, environmental factors were the most powerful factors. Therefore, the university should focus on public relations activities and integrated curriculum to meet the need of students. These should include elderly care management (integrated curriculum between management science and nursing) or tourism management (integrated curriculum between management science and social science). These activities might increase the numbers of graduate students at NPRU.

### B. Suggestions for Further Studies

1) This research was a quantitative research. Qualitative research, however, can be conducted for more in-depth information, which may improve and revive the curriculum and learning process.

2) Future studies could be in details on the program that students will be study would be interested to study.

3) There should be a comparative study about the incentives for admission to master's degree programs from undergraduates at universities. This should use comparative analysis.

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# Difficulties in learning grammar of business English students at Nakhon Pathom Rajabhat University

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## Abstract

The aim of this research was to identify problems happened in learning grammar of business English students at Nakhon Pathom Rajabhat University, Nakhon Pathom. Qualitative method was used to collect the data. The current study employed purposive sampling and the samples were 40 students who registered in English Usage 1 subject in the first semester of academic year 2018 and did not pass the mid-term exam. The sample consisted of 40 females and 16 males in a class. To collect the qualitative data, the semi-structured interviews were used; for example, do you have any problems in learning grammar, what problems happened in during the lecture, with recorded interviews. The researcher applied open and axial coding techniques in order to group, analyze, and interpret the data. The results showed that there are many difficulties in learning grammar such as identifying parts of speech, students' vocabulary size, applying knowledge, and others.

**Keyword:** difficulties, grammar, students

## I. INTRODUCTION

Students' voices in any educational institute are very important. Students have their own abilities for providing some useful opinions on a variety of levels including sharing their difficulties and complexities on problems and potential solutions [1]. By not involving students, it can be said that there are some failures occurred in the educational process.

Teaching and learning process consist of many important things. Two of them are teachers and students. Like communicative process, it consists of senders and receivers. In the classroom, teachers are as same as senders and students are receivers. If the message is directly sent to the receiver, but the receiver cannot accept it, it means that there are some problems that have occurred during the teaching and learning process. It could also be said that the communication between teachers and students have failed. On the other hand, if the receiver can get and understand the message, it means that the communication has been effective and efficient.

The English language is the most international language used in the world. There are many native and non-native people speaking English. It affects people all over the world in order to learn and acquire it accurately. To be successful in acquiring language, there are many components and dimensions in language acquisition such as listening, speaking, reading, writing, vocabulary, grammar, and so on [2]. In the language teaching and learning process, accuracy of grammatical points including sentences, structures, tenses, and so on is one main key part. Grammar lays the groundwork for effective communication. Therefore, teaching and learning grammar is an important aspect of foreign language instruction. Teaching grammar should not be ignored. Some theorists have said that teaching grammar is the most useful way to acquire the English language or any language in the world. Others said that teaching grammar cannot provide students' abilities in order to acquire language. They have suggested other interesting methods to support students' language learning such as Audiolingual, Communicative, and Natural Approaches [3] to learn grammar.

Incorrect grammar can affect the meaning and clarity of what the speakers wanted to communicate. For example, when you were young, you had to imitate and speak according to your parents. If you made mistakes, your parents would correct your grammar. In addition, at the higher educational level, grammar is very important in writing. It is required for the educational personnel. Proper grammar is essential for understanding English as a second language as well as for learning a new language, since all languages follow grammatical patterns.

### A. Statement of the Problem

There are a lot of researchers suggesting many effective ways to teach and learn grammar. However, the problems do not relate to the ways the learners used to help them learn, the problems do relate to their difficulties and complexities in learning grammar. Students' voices can reflect some valuables in their minds out to teachers. Those difficulties and complexities the problems reflect would help teachers become aware of students' reasons and could be used to improve classes with more effective teaching methods [4].

This study, therefore, wants to capture some insights from current students' voices and to focus on the difficulties and complexities they have faced during grammar classes.

### B. Objective of the Research

The present study aims to find out what difficulties and complexities the students (business English students, Nakhon Pathom Rajabhat University) faced with while learning grammar.

### C. Conceptual Framework

In teaching-learning grammatical features, teachers faced teaching problems and students faced difficulties and complexities as well. Many difficulties and complexities faced by the students vary between individuals. To explain these teaching and learning process problems, there are many theories relate to Second Language Acquisition, Structural

Grammar, Generative Grammar, and Universal Grammar. The conceptual framework of the study is shown below.

In learning second language, it was found that learners use grammatical features incorrectly. This arises from the students using Thai language in daily life and students in the Thai context all the time. When comparing Thai and English grammar, students may become confused and it affects students' acquisition on second language.

Structural Grammar aims to explain language in terms of the functions and the relationships to each component without focusing on meaning. It can be said that structural grammar does not include semantics, phonemes, morphemes, and syntax [5].

The concept of Universal Grammar (UG) first initiated since 1940s created by Noam Chomsky. It is based on the idea that grammatical features are universal in every language [6]. This means that there is something in common in every language. However, each language is different. Grammar must contain a finite system of rules. Learners have to understand grammar because it explains the natural structures in the target language. When second language learners acquire knowledge of the grammatical features correctly, they can have good acquisition of a second language and will have the ability to use the language effectively and efficiently.

Later in the mid-1950s, Noam Chomsky also suggested the new concept of grammar called Generative Grammar. It was explained that native of each language had to know grammatical rules and used them in daily life. Chomsky also pointed out that natives of each language can build unlimited sentences with limited grammatical structure rules [7]. The traditional practice of analyzing sentences was considered in terms of parts of speech.

Actually, Structural Grammar, Generative Grammar, and Universal Grammar are focused on the rules of grammar. In other words, grammar is key in order to learn a second language.

Nevertheless, learning grammatical features including forms or structures is the basis of learning a second language. However, students still faced difficulties and complexities in acquiring a new language.

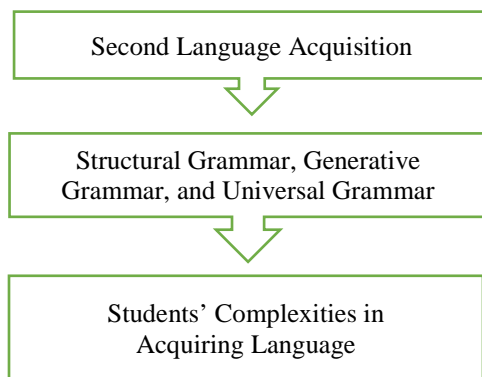


Fig. 1. The Conceptual Framework of the current study.

From the concepts above, understandings of theory of Second Language Acquisition, Structural Grammar, Generative Grammar, and Universal Grammar affected students' difficulties and complexities in acquiring second

language especially in grammar class. This could help the teachers understand the theories and improve not only their teaching styles, but also help students correct their difficulties and complexities.

#### D. Scope of the Research

This research carried out in a particular higher education EFL context. Participants of this study were business English major students at the Faculty of Humanities and Social Sciences, Nakhon Pathom Rajabhat University who volunteered to participate. This study was limited to the participant purposive sampling recruitment for the interview data collection. In addition, since this study had been carrying out only in a particular Thai university context, generalization of the results must be taken with caution. Findings of this research could not be generalized as characteristics of graduate students in other universities in Thailand.

#### E. Significances of the Research

There were six significances of this research; 1) it looked into students' voices why they failed the mid-term examination or what kinds of difficulties they faced during the grammar class, 2) findings were anticipated to provide useful information which would help teachers understand students' difficulties in learning and had some awareness why they did not get passed the exam, 3) findings benefited how teachers perceived students' scores and how teachers coped with those kinds of problems, 4) this research had worthiness in teachers' training program by giving some insights into sources of students' difficulties so that relevant training could be prepared for teachers to cope with those students' difficulties and problems, 5) teachers could develop their teaching and learning process, and 6) learning the reasons and suggestions why business English major students failed the mid-term examination and provided valuable information with the hope of channeling all the energy towards student academic success.

## II. LITERATURE REVIEWS

#### A. Definitions

There are many researchers giving the definitions of Grammar in many dimensions. In conclusion, [8] said that grammar is about the rules of language including sound, vocabulary, phrase, clause, sentence, and structure in order to be understood and communicated with other people.

#### B. Problems in Learning Grammar

There were many types of problems in learning grammar mentioned as follows.

[9] said that the hardest thing that most English teachers faced was students' difficulties in order to use of the rules of grammar taught in the classroom flexibly in different situation or any context.

[10] investigated grammatical difficulties in Myanmar with 50 first-year students from Yadanabon University, Myanmar. The participants did the questionnaire to give their information. The results showed that students faced with quantifiers. They could not identify which types of noun were used with each noun.

[11] aimed at investigating and identifying students' difficulties in EFL context. 30 students were participated in the study. They were invited to write a composition. The results showed that there were several mistakes occurred in their writing. He also found that EFL students said some words were not in the dictionary in a separated form and the meanings were too hard to find.

[12] wanted to find the overall picture of English language teaching in Thailand. Multiple-choice exam was aimed at getting rid of. Therefore, teachers tried to put open-ended questions in the exam. Some of the students were not familiar with this kind of the test. They had no choice to help them do the exam.

### C. Related Research

It can be said that grammatical matters are the main factors affecting listening, speaking, reading, and writing skills development [13]. Grammatical features are related to every skill above. Many researches have been done in a particular way as follows.

[14] conducted a study to investigate 1) students' English grammar ability and 2) its relationship with reading and writing skills. The participants were 76 English teachers and 370 students. The data collection tools were a test of English grammar, a reading test, a writing test, questionnaire, and semi-structured interviews. The study found that students' English grammar ability, reading and writing skills were low. Also, there were positive relationships between grammatical matters and reading and writing skills. It can be said that if students had high score in grammatical points, they could get high score in reading and writing as well. On the other hand, if students had low score in grammar, they also tend to have low score in reading and writing skills.

Another study was conducted by [15] in Thailand. The subjects were 350 undergraduate students from 7 faculties in Rajamangala University of Technology Krungthep. An English reading test and a set of questionnaires were used to collect the data in order to survey English reading abilities and study problems and factors affecting English reading problems of students. The results showed that the second factor affecting students' reading abilities was the knowledge about grammar.

[16] did the study about problems of English speaking in oral presentations and expressing opinions in public. He wanted to solve 179 undergraduate students at the Faculty of Management Sciences, Kasetsart University. The research tools were rating-scale questionnaire, participatory observation, and structural in-depth interview. He found that one of students' major problems was insufficient amount of vocabulary and also meanings of words.

## III. RESEARCH METHODOLOGY

### A. Research Method

[17] said that the qualitative research used in many researches was to get better understanding of any particular phenomena. Also, he identified that one of the most advantages in the qualitative research is to describe human complexity such as emotions, behaviors, opinions, and beliefs which cannot be measured by statistics. Qualitative research

can pull out students' deep details especially in difficulties and complexities. This method helped the researcher get more real information and had better understandings in what the students reflected. From the situation, business English freshmen are from different background such as family, area, and educational institute. These affected students' proficiency level of learning English. So, using qualitative research with interviews can perceive any difficulty and complexity. Quantitative research cannot be employed to find out the answers. Therefore, this research was employed a qualitative method to collect the data in order to find out what kinds of difficulties happened during the grammar class in learning English Usage 1 subject. The researcher could get deeper information from the students' voices.

### B. Population and samples

According to the purpose of the research, purposive sampling procedure was used for recruiting business English students to gather the data from. The whole population were 40 Business English students in the first semester of the 2018 academic year who registered in Course English Usage 1 and failed the mid-term examination at the Faculty of Humanities and Social Sciences, Nakhon Pathom Rajabhat University. Mid-term examination had four parts covering the content about parts of speech. Nakhon Pathom Rajabhat University is at the first rank of the Rajabhat universities in the western area. All students are freshmen between 17 and 19 years of age including both males and females. They are studying in business English major. The whole population of students (40) were asked to volunteer to participate in the research. As well, all student population were asked to interview about their difficulties and complexities in English Usage 1 class. However, these students would not be told that they were selected because they failed. Instead, they were informed that the researcher wanted to help them learn well and solve some problems. All participants' names were removed and changed to pseudonyms. The scores were shown below. (see Table 1)

TABLE 1. STUDENTS' MID-TERM SCORES

Name	Score	Name	Score
Karn	8	Nat	0
Kanya	4	Nip	2
Kwan	2	Nipp	2
Wat	4	Niti	8
Charin	7	Tin	2
Chira	6	Than	9
Krit	4	Jes	4
Rat	2	Lad	5
Lay	4	Siri	2
Art	5	Sek	9
Nari	7	Wi	5
Pon	4	Wise	2
Piji	2	Sasi	8
Pim	2	Sue	7
May	5	Sut	9
Young	9	Su	7
Warn	8	Man	1
War	4	Vi	3
Soup	4	Sanh	2
Maya	3	Wawa	4

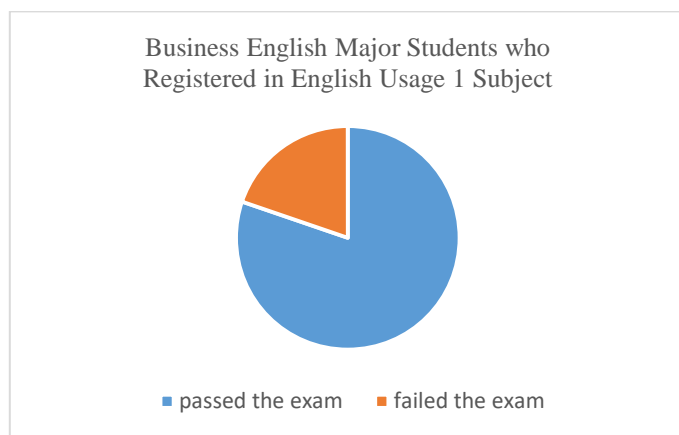


Fig. 2. The Percentage between the Students who Failed and Passed the Mid-Term Examination.

From Figure 1, it was shown that there were 53 students in class, but there were 40 students failed the exam. It can be said that only 24.53% passed the exam.

### C. Data Collection Tool

According to Scott and Morrison' notions (2007, p.133), they noted that "interviewing seems a deceptively simple way to find out what interviewees think, see, and do, and how researchers interpret the telling". It was the continual process in order to get more details from the interviewees. To identify problems of business English students in learning grammar, student participants who were purposively selected and who volunteered to participate in the study will be interviewed with recorded interviews. [18] classified types of interviews into three types: (1) structured, (2) unstructured, and (3) semi-structured interviews. The instrument employed in this study was semi-structured interview (Interview Guided Approach) in order to ask what problems existed in learning grammar. This kind of interviews had many benefits. One of them was the interviewees felt free to answer the questions without any pressure. Moreover, it gave a chance for the interviewer in order to add more additional details during the interviews if necessary. After that, all of the data will be transcribed and then transferred to computer. There were three steps of creating the questions used in the semi-structured interview of this research. Firstly, the researcher did the literature reviews. Then, the research adapted and applied some guideline questions used in the research. Finally, the researcher used those questions with the participants and also could add more other related questions during the interview process. (see Figure 2)

### D. Data Analysis

Regarding data from the interviews, one of qualitative data analysis was employed. The researcher followed the notions of open and axial coding techniques [19]. According to Strauss and Corbin (1990), filed notes and the transcription of interviewed could be analyzed using two kinds of coding: open and axial coding techniques. Open coding is the process of breaking down, examining, selecting, comparing, conceptualizing, and naming the transcribed data. Open coding was used to identify the categories of information in participants' responses. Next, axial coding was used to

reorganize the categories to create related and more meaningful groups of data. These two techniques could help the researcher systematically categorize qualitative data concerning students' difficulties and complexities in the classroom. The ideas of open and axial coding helped explain categories of the data, including the relationship between the categories in each situation as well.

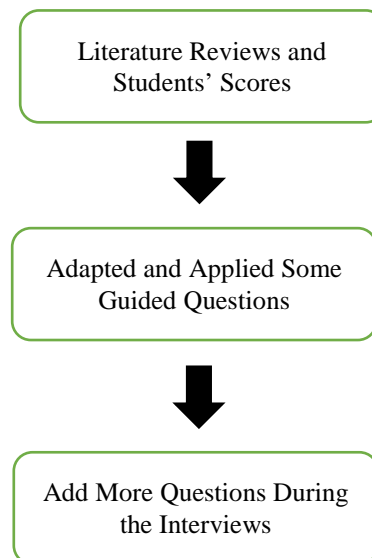


Fig. 3. The Process of Creating Semi-Structured Interview Questions.

## IV. RESULTS

According to the interviews, there were five most frequently occurred difficulties in English Usage 1 subject class respectively. (see Table 2)

TABLE II. STUDENTS' DIFFICULTIES IN LEARNING GRAMMAR FOUND ORDERING BY RANK

Ranking	Interviews (40 students)
1	They could not identify what each part of speech is.
2	They did not know the meanings of each word.
3	They could not apply the content they learned to the exam.
4	They only focused on remembering the rules of grammar.
5	They did not understand the instruction of each part.
6	Other difficulties and complexities the students faced with.

100% of all 40 students said that the first most frequently occurred difficulty of the students was "they could not identify what each part of speech is in a sentence or in a context". In learning parts of speech in English Usage 1 class, the content covered with noun, verb, adjective, adverb, pronoun, preposition, conjunction, and interjection. The mid-term examination wanted students to identify each word into each type as shown below. (see figure 3)

## Part II: (5 points)

Instructions: Identify parts of speech of the underlined words.

## AFTER THE FLOOD

Reading about weather in books is one thing, but living 11. through a natural disaster was another. 12. Even though the flood was not too bad, I was not prepared for what it was really like! It all started two days ago. It was a rainy day, like every other rainy day I've ever remembered. The only unusual thing was how anxious the adults seemed to be getting. I started to pay more attention whenever I saw the news on at our house, at a restaurant, or anywhere else. The 13. meteorologists kept saying that the rain 14. hadn't stopped in a long time, and it didn't look like it was going to stop anytime soon. I didn't really know what that meant for us, since Mom was 15. always saying that rain was good for all the plants. The next morning, however, I began to understand. I woke up and went down for breakfast. Usually Mom or Dad was already eating by the time that I woke up, but neither of them was at the kitchen table, and the lights all over the house were off. This is 16. weird, I thought. I went to get out the milk, but there was a note on the refrigerator telling me not to open the door. As I was wondering what I could eat for breakfast, I noticed that the rain was still going, and that I could hear noises coming from the basement. I went to investigate. Peeking through the basement door, I immediately stopped. There was water down there! It didn't look like a lot, but there were toys and things floating by! I could hear Mom and Dad's voices. "Hello? What's going on down here?" I called 17. down the stairs. "Good morning, Vicky. All of this rain is causing some problems. The power all over town is out. Our basement is flooded, and so are some of the roads. A lot of houses have water in them, too," Dad called back. Reading & Math at [www.k5learning.com](http://www.k5learning.com) Try our online 18. reading & math program 14 days free trial. [www.k5learning.com](http://www.k5learning.com) A little water didn't seem too bad, and the power had gone out before, so I wasn't too worried. Mom and Dad seemed to be taking care of it. They were talking about a pump, so I think they were getting the water out of the basement. I went to go play in my room. Not too long after, Mom and Dad came back upstairs, changed their clothes, and washed their hands using hand sanitizer. I asked them what was going on. 19. "Well, we pumped the water out by hand, but there's some damage downstairs. We're going to have to find some fans once the power comes back to try to dry out the basement as much as we can, but we might have to tear out the drywall and 20. replace it.

Fig. 4. Example of One Part of Mid-Term Examination

This could be supported by students' statement; they mentioned in the interviews that they felt annoyed about parts of speech. They could not categorize what each part of speech is. It affected their scores. Nat (SS 21) said,

"Ajarnnn Duangjit! Your exam is too hard for me. I did not know and understand what part of speech of this word is. So, I guessed the answers and all are wrong."

Also, Man (SS 37) supported Nat's statement. He mentioned,

"When I am studying in class, I understand everything and I can answer your questions. But I do not understand why I cannot do the exam well and I felt annoyed after the test."

Moreover, Kwan, Rat, Piji, Pim, Nip, Nipp, Tin, Siri, Wise, and Sanh (students who failed and got only 2 scores out of 20 scores) totally agreed that the teacher went through the content so fast, they could not catch up the content as much as their friends. Kwan stated,

"Once, Ajarn Pocky cancelled class because she has a few errands to run such as a meeting. The next class, she taught three lessons in three hours, I could not keep up with my friends and teacher's explanation. Therefore, I could not do the test well and failed the exam."

The second most frequently occurred difficulty in the grammar class was "they did not know the meaning of each word; therefore, they could not decide which word is noun, verb, and so on". Maya and Vi had the similar sayings,

"We have a few words in my head. We did not know the meanings of word. When doing the test, I felt empty."

In addition, Kanya, Wat, Krit, Lay, Pon, War, Soup, Jes, and Wawa totally said that they had a small vocabulary size or word bank. It affected the scores of the test as Jes stated,

"For me and my close friends, we know the meanings and parts of speech of simple words. In the mid-term exam, there are a lot of difficult words which I do not know. I leave some of the answers empty."

The third most frequently occurred difficulty was "they could not apply the content they learned to the exam". According to the content the students learned in class including a lot of content such as parts of speech. There were too much content for the first-year students to learn. They could not adapt themselves to learn in the university level. They could not catch the main point of each part. When teaching, the researcher as the teacher taught them grammar in a context. However, they could not apply each part to the context. It can be said that they had no strong basic knowledge about grammar enough. So, while testing, they felt confused to identify each word in the context. Chira stated,

"There are a lot of content that you put into me in one hour. I was not good enough to understand all things the teacher said as same as my friends". I was a slow student.

Additionally, Charin assisted this point about the load of content below;

"For me, there are over 50 students in my class. Some points of the content are difficult. I cannot catch up the teacher's explanation in each part. During the class, the teacher is teaching with integrated part. For example, the teacher has taught noun with pronoun. In fact, I was really confused each one.

The fourth most frequently occurred difficulty was "they only focused on remembering the rules of grammar". Students always remember the rules of grammar without making understandings. Actually, there are a lot of rules of grammar. Students could not remember all of them. Karn, Warn, Niti, Sasi agreed with this difficulty. Niti identified,

"A lot of rules make me crazy. I cannot remember all of them. I can give you an example. Someone said noun is easy, but in fact it can be divided into many subsets of noun such as

concrete noun, gender noun, abstract noun, or etc. The mid-term exam includes everything in not only noun but also all parts of speech”.

The fifth most frequently occurred difficulty was “they did not understand the direction of each part”. They could not get what each part of the test wanted them to do. When reading the direction wrongly, they made the test wrong too. This can be supported by Art, May, Lad, And Wi’s remarks. Art said,

“I could not read the direction because I could not translate it into Thai. I did know what it wanted me to do.”

Lad supported Art’s remark that she misunderstood about the direction of each part. So, this affected her score and made her failed the test. She mentioned,

“I understood that the direction told me to identify types of parts of speech. In fact, it wanted me to do the pronoun references. Therefore, every item I answered were all wrong.”

The sixth most frequently occurred difficulty was “other difficulties and complexities the students faced with. There were two reasons related to this ranking. The first one was the students did not work hard outside the classroom. The other was the mid-term examination was quite hard.

Young, Than, Sek, and Sut all agreed that they did not read and review books before the exam enough. Young mentioned,

“I accepted that I did not read books enough. After class, I did not review the lesson”.

Sek added more information about reading books before the test as follow.

“At first, I thought that I could read and review books timely. In fact, I could not read all of them within a few days. It took time to understand all.”

Than said that he had some problems with the test. At high school level, he was familiar with multiple choice tests. When studying Bachelor degree, I had to do write-up examination. He stated,

“I like multiple choice tests. When I was at Matthayom, I enjoyed doing multiple choice examination because there were four choices helped me decided what the answer was probably correct. I felt shocked in order to do a test like this (write-up examination). Moreover, I had to analyze each word as well.”

Shortly, semi-structured interviews indicated many difficulties and complexities including identifying parts of speech, unknowing meanings of words, applying the content they learned to the exam, remembering the rules of grammar, misunderstanding the instruction, and other difficulties and complexities.

## V. DISCUSSION AND CONCLUSION

In relation to previous studies, the results in this study were found to be convergent to those of previous studies by [14]. The research found that students could not identify what part of speech was in each word as the top most difficulties in learning grammar. So, students could not identify each word in the exam correctly.

[20], in particular, found that the students did not know the meanings of each word. The present study showed the similar results. It was found this at the second most difficulties during the class. When students could not understand what

each word meant, they could not get to the point.

According to [21], the hardest stuff that most students faced was the flexibilities to use all of the rules of grammar taught in the classroom in daily life. This was at the third ranking. Similarly, the results in this study supported their ideas. Some of the students could not apply the content they learned into any situation.

Other related problems found in this study were types of the test and students’ attempts. These can be said that students were not familiar with write-up examination. This result was similar to the results found by [22].

To sum up, teachers faced with teaching difficulties and students also faced with learning complexities. To understand students’ reason from their voices, teachers have to deeply know them first and then try to solve those problems with effective ways. These results will help second language learners learn language effectively with the understandings of difficulties and complexities about grammar. Later, they can understand and solve their problems before learning other parts of grammar and did not feel bad anymore.

## ACKNOWLEDGMENT

This research article was one of the products which was being participated by 40 first-year students who registered and failed the mid-term examination in English Usage 1 course. Therefore, I would like to say thanks and acknowledge them in order to devote themselves to be a source of information and provided some insights.

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# **Session of Environmental Engineering and Science**



# Impacts of climate change on irrigation water management by the Sirikit dam in Thailand

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## Abstract

The trend of climate change impact on the irrigation water management by the Sirikit reservoir, a large dam in Thailand, which supplies water along with the Bhumibol reservoir to the irrigation areas in the Chao Phraya basin is determined. Three periods : present (1979-2006), near future (2015-2039) and far future (2075-2099) are considered. The study result shows various trends in the climatic and hydrological parameters which have associated impacts on water management. Thus, the air temperature will increase but the relative humidity will decrease. The evapotranspiration and irrigation water demand will increase. Both rainfall and inflow to the reservoir will decrease in the near future, but increase in the far future. As this matter of fact, the water management for the irrigation areas will be affected, such that the water deficit and number of deficit years will increase in near future, but decrease in the far future. Both negative and positive impacts are due to the study result that the varying water supply by the Sirikit reservoir may be less or more than the increasing water demand. Also, the impacts of climate change on the irrigation water management by the Bhumibol dam, adjacent to the Sirikit dam, is compared and discussed. For possible adaptation measures to future climate change, various non structural and structural measures are proposed for implementation.

**Keywords :** trends of climate change, irrigation water management, Sirikit dam

## I. INTRODUCTION

Climate change affects the reservoir operation and also the water management for the irrigation areas in the Chao Phraya basin or the Central Plain basin in Thailand. Sirikit reservoir is one of the major water resources of that country, supplying water along with the Bhumibol reservoir to the irrigation areas in the basin. The reservoir water budget and water allocation are often limited and causes water shortage during dry seasons. In addition, the trends of climate change and their impacts on water management is another risk. This paper presents the study results of the trends and impact of climate change on water management under reservoir operation of the Sirikit dam [1][2].

## II. OBJECTIVE OF STUDY

The objective of the study is to analyze the trends and impact of climate change on water management of Sirikit dam on the irrigation areas in the Chao Phraya basin in 3 time periods : present (1979-2006), near future (2015-2039) and far future (2075-2099). The study results on water management are the amount of water deficit and number of deficit years.

## III. STUDY AREA

The Sirikit dam is a multipurpose reservoir, located in the Nan river basin in the northern region of Thailand and delivers water to the irrigation areas in the Chao Phraya basin. The reservoir has the total storage of 9,510 Million cu.m., active storage of 6,660 Million cu.m. and the average annual inflow is 5,376 Million cu.m. The hydropower generation is 500 MW. The study area, with the Chao Phraya basin, is shown in Fig. 1.

## IV. SIRIKIT RESERVOIR OPERATION RULE CURVES USED PRESENTLY

In general, the reservoir operation rule curves, namely general rule curves, are developed from the hydrological data of a long period of 30 years or longer. The rule curves are applied to the reservoir operation in every water year, whether it is a wet, normal or dry year. The upper and lower rule curves are applied for different water conditions. The reservoir water level is operated not to be above the upper rule curve in the wet years and not to be below the lower rule curve in the dry years. Recently, due to the large flood event throughout Chao Phraya basin, affecting even Bangkok, in the year 2011, the Royal Irrigation Department of Thailand has developed one more set of reservoir operation rule curves, namely flood rule curves, which are applied to reservoir operation in a large flood year as it had happened in the year 2011. These new flood rule curves, in order to prepare for more storage for large flood inflow, are defining lower storage levels than the general rule curves. However, these new flood rule curves can reduce the adverse flood conditions in flood years, they may increase water deficits in other, normal or dry years [1]. In this study, the general rule curves are applied to determine the water deficits in every month of the years. The general (old) and flood (new) reservoir operation rule curves are shown in Fig. 2.

The methods used to achieve the goals stated earlier are :  
1) trend of climate and hydrology based on MRI GCM climate data model (Japan) with hybrid bias correction [1],

- 2) rainfall – runoff analysis (inflow to reservoir),
- 3) water demand estimation,
- 4) water release from reservoir operation.

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### 5) water balance for water deficit study.

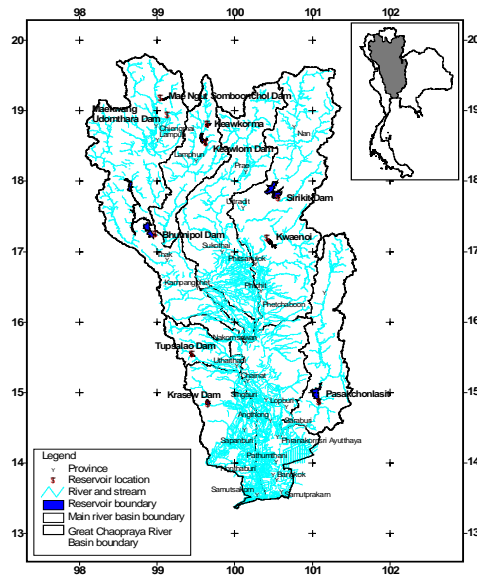


Fig. 1 Map of Chao Phraya basin of Thailand with location of the Sirikit dam

## V. STUDY RESULTS

### A. Trend of climate and hydrology of the reservoir

#### A.1 Temperature and relative humidity

Annual mean air temperature and relative humidity at the Sirikit dam for present, near future and far future periods are analyzed and shown in Fig. 3. The results show that annual mean air temperature values tend to increase in the near and far futures. The annual mean relative humidity values have also an increasing trend in the present period, though with wide fluctuations, but tend to decrease with wide fluctuations in the near and far futures.

#### A.2 Evapotranspiration and irrigation water demand

The estimated annual evapotranspiration and irrigation water demand of the Sirikit dam in present, near future and far future periods are shown in Fig. 4 and Fig. 5 respectively. The irrigation water demand for each cropping is determined from the total cropping areas and the cropping water requirement rate computed from the evapotranspiration rate minus the effective rainfall depth [1]. Both variables tend to increase which can be understood as a consequence of the air temperature increase as shown in Fig. 3.

#### A.3 Rainfall

The annual rainfall at the Sirikit dam tends to increase for the present period, decrease in the near future and increase in the far future as shown in Fig. 6.

#### A.4 Annual inflow to the Sirikit reservoir

The annual inflow to the Sirikit reservoir tends to increase for the present period, decrease in the near future and increase in the far future as shown in Fig. 7. The trends of inflow are similar to those of rainfall.

#### A.5 Monthly inflow, storage and release from Sirikit reservoir

In the present period, the mean values of inflow, release, total storage and useful storage in the rainy season from May to October in the Sirikit reservoir are 4,918 million cu.m., 2,242 million cu.m., 5,390 million cu.m. and 3,032 million cu.m. respectively [3]. Monthly mean values of inflow, storage and release from the Sirikit reservoir in the present, near and far future periods are shown in Fig. 8. All three variables tend to decrease in the near future and increase in far future.

### B. Impact of climate change on water deficit of Sirikit dam

The annual and seasonal water deficits in the irrigation areas under the Sirikit reservoir operation are shown in Table I. The amount of water deficit and number of deficit years will increase in the near future and decrease in the far future. Both negative and positive impacts are due to the study result that the varying water supply by the Sirikit reservoir may be less or more than the increasing water demand. It is noted that the water deficits are higher for the wet season than for the dry season. This is because the cropping areas in the wet season are practiced more than those in the dry season due to the farmers having more confidence in more water availability in the wet season, thus encountering more water deficits particularly in the dry years.

### C. Comparison between impacts of climate change on water deficits of Bhumibol dam and Sirikit dam

Bhumibol dam is located in the Ping river basin while Sirikit dam is located in the Nan river basin as shown in Fig. 1. The Ping river basin is located on the west of the northern region while the Nan river basin is located on the east of the northern region of the Thailand. Referred to the study result of the impacts of climate change on water deficit of Bhumibol dam [4], the annual and seasonal water deficits in the irrigation areas under the Bhumibol reservoir operation are shown in Table II. The amount of water deficit and number of deficit years will decrease in the near and far futures. This positive impact is due to the study result that the increase of the water supply by the Bhumibol reservoir will exceed the increase of the water demand. It is noted that the water deficits are higher for the wet season than for the dry season.

Comparing Tables I and II, the impacts of climate change on water deficits of Bhumibol dam and Sirikit dam are compared. Even though the river basins of the two dams are located in the northern region, the impact of climate change on water deficit of the two dams has the different trend in the near future but the same trend in the far future. In the near future, the rainfall and runoff will increase in the Ping river basin and thus reduce the water deficit of the Bhumibol dam. Differently, the rainfall and runoff will decrease in the Nan river basin and thus increase the water deficit of the Sirikit dam. However, in the far future, the rainfall and runoff will increase both in the Ping and Nan river basins and thus reduce the water deficits of both the Bhumibol dam and Sirikit dam. This study result indicates that it is possible that the impacts of climate change on rainfall, runoff and water deficit in the adjacent river basins may be the same or different in the future period.

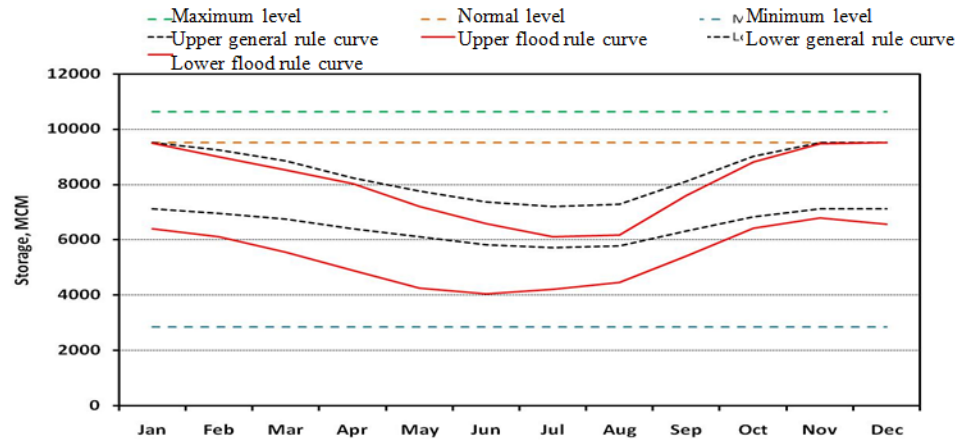


Fig. 2. General and flood reservoir operation rule curves of the Sirikit Dam

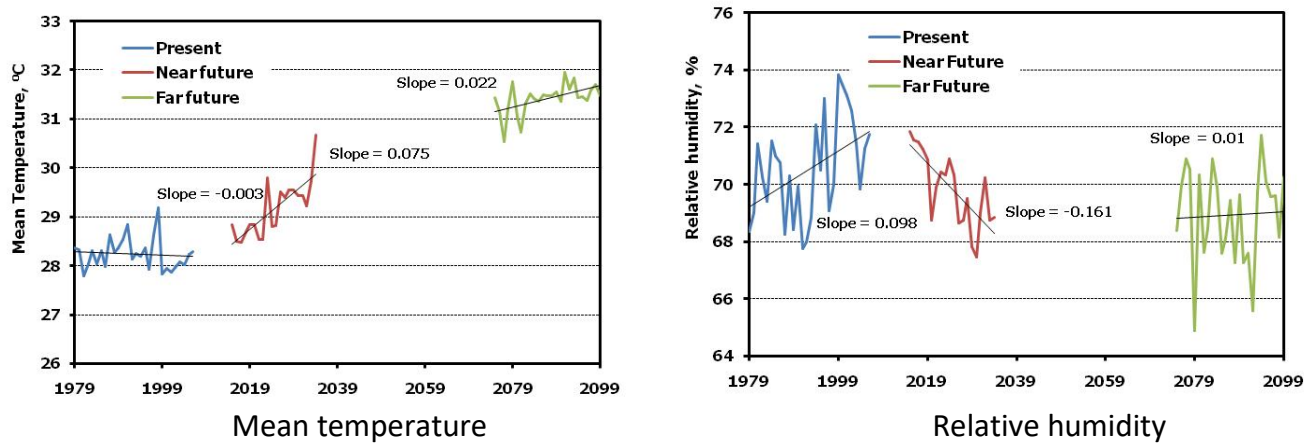


Fig. 3. Time series of annual mean air temperature and relative humidity at the Sirikit Dam

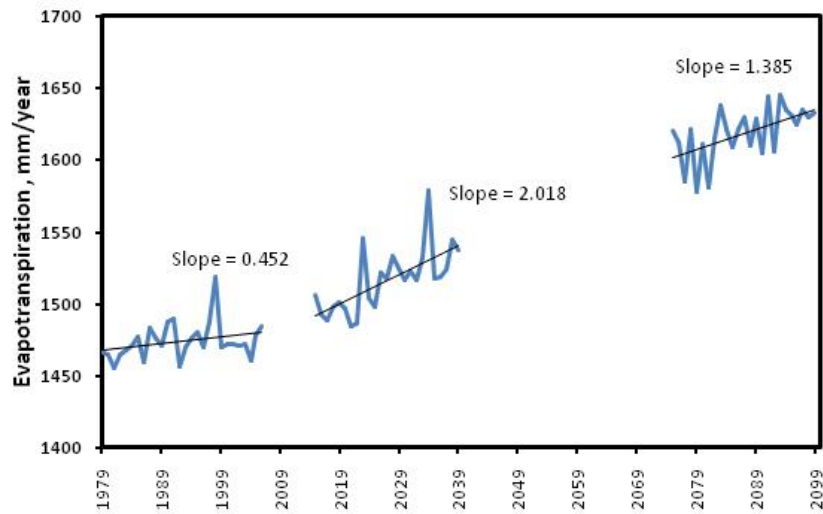


Fig. 4. Time series of annual evapotranspiration of the Sirikit Dam

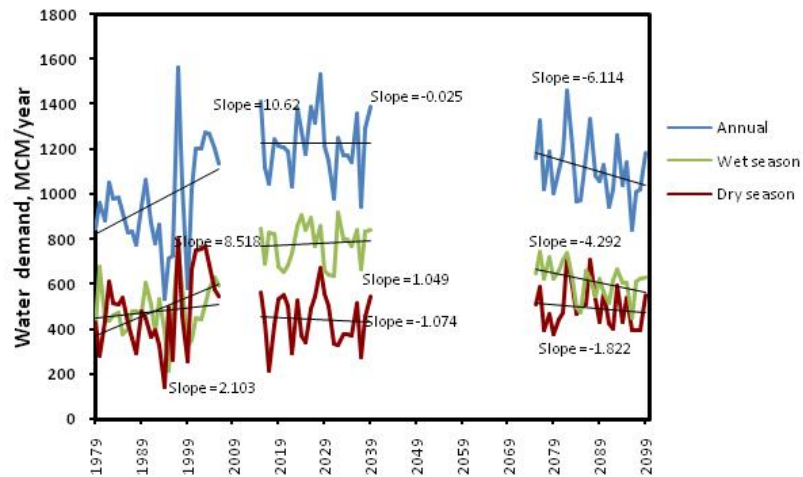


Fig. 5. Time series of annual water demand of the Sirikit Dam

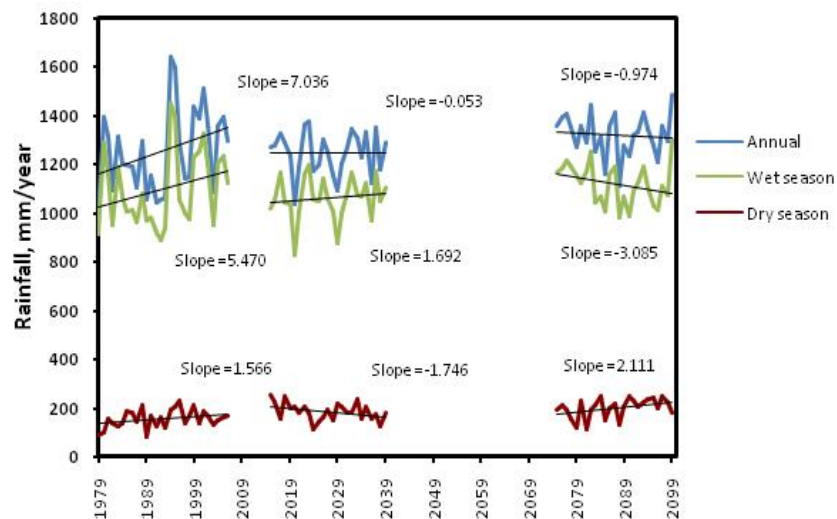


Fig. 6. Time series of annual rainfall of the Sirikit Dam

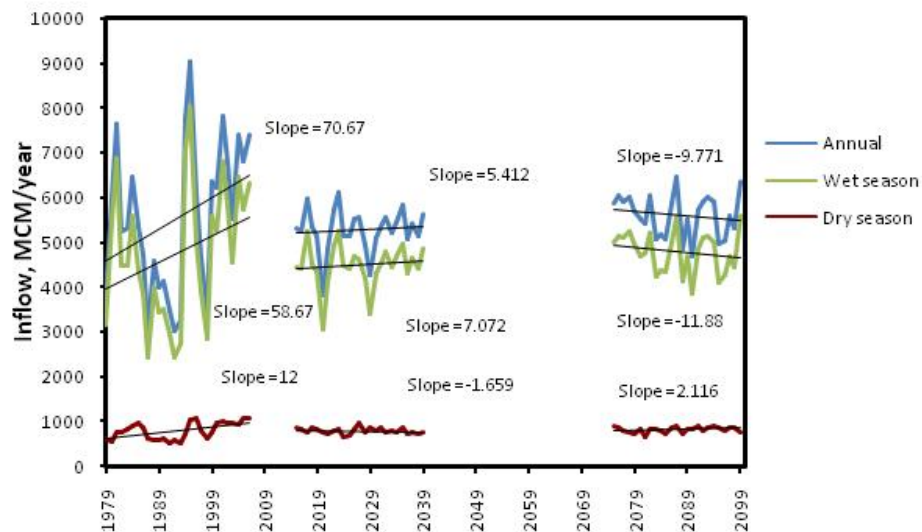


Fig. 7. Time series of annual inflow of the Sirikit Dam

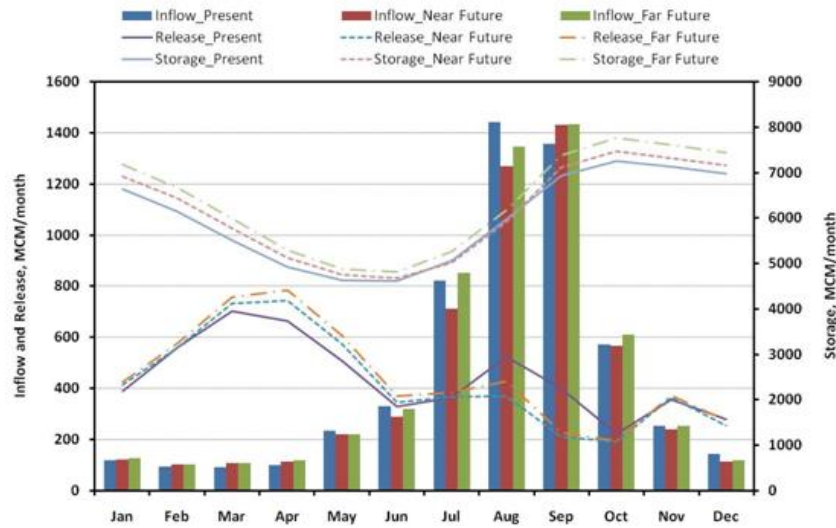


Fig. 8. Monthly mean inflow, storage and release from the Sirikit reservoir

TABLE I. ANNUAL AND SEASONAL IRRIGATION WATER DEFICITS OF THE SIRIKIT DAM

Unit : Mm<sup>3</sup>

PERIOD	DRY	WET	ANNUAL	NO. OF DEFICIT YEARS
Present	41.47	171.78	213.24	7
Near Future	44.36	219.49	263.85	12
Far Future	33.55	104.49	138.04	3

TABLE II. ANNUAL AND SEASONAL IRRIGATION WATER DEFICITS OF THE BHUMIBOL DAM

Unit : Mm<sup>3</sup>

PERIOD	DRY	WET	ANNUAL	NO. OF DEFICIT YEARS
Present	625.16	1097.76	1722.92	14
Near Future	350.96	1011.86	1362.83	6
Far Future	491.25	868.40	1359.64	4

## VI. POSSIBLE ADAPTATION MEASURES

As possible adaptation measures for mitigating the water resources to increase water supply.

- 1) adjust Sirikit reservoir operation rule curves to increase water release in the water deficit month.
- 2) improve water allocation to increase water supply in the water deficit month.
- 3) increase forest areas by 20% to have the same forest areas as in the year 2,000 in order to increase the flow in dry seasons and also in rainy seasons.

4) adopt conjunctive use of surface water and groundwater to mitigate water deficit.

5) reduce water demand by reducing cropping areas, planting less water consumptive crops.

## VII. CONCLUSION

The trends of climate change during three periods (present, near future and far future) based on the predicted climate by bias-corrected MRI GCM data in the irrigation areas under water management by Sirikit dam are determined.

The air temperature will increase, but the relative humidity will decrease. In parallel, evapotranspiration and irrigation water demand will increase. However, both rainfall and inflow to the reservoir will decrease in the near future, but increase in the far future. This forecasted climate change will have impacts on the water management for the irrigation areas controlled by the Sirikit reservoir. The results showed that the water deficit and number of deficit years will increase in the near future, but decrease in the far future. Therefore, the results illustrated the uncertainty of water management and the risk of water deficit due to the climate change. For possible adaptation measures to future climate change, various non structural and structural measures are proposed for implementation.

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# Gap analysis of environmental management system standard ISO14001:2015 conformity of a large school in Nakhon Pathom, Thailand

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## Abstract

The Office of the Basic Education Commission in Thailand requires schools to have activities relating to environment learning within their curriculum. Schools should promote environmental learning that can be performed continuously and sustainably. [9] Many schools in Thailand employ the ISO 14001 Environment Management standard to reduce costs and emissions. This can create a good image, ambiance, and environment for the school. This research analyzes the ISO14001:2015 conformity of a large school in Nakhon Pathom, Thailand. It used Gap analysis and found that the top management of the school is likely to be concerned about the impact of their school on the environment and the ISO14001 environmental management system. The large school has committed resources to the environmental management system. Nevertheless, it was found that the school still has other activities to complete. These include the production of an environmental management system plan as well as its' implementation, and operation. It was concluded that the school should include the environmental management system into its strategy. The preparation of SWOT analysis for the environmental management system was highly recommended.

**Keyword: Gap Analysis, ISO 14001, Environment Standard**

## I. INTRODUCTION

"Newsdays, Thailand has available resources, including both natural and human resources. We can use them to enrich abundance and permanent stability of the nation in the proper way. Importantly, we must know how to use those resources wisely that they should not be misused or wasted. They must be utilized carefully and economically along with academic approach, rational, and appropriateness by aiming for the true benefit being gained by the nation in both present and the far sustainable future." (The Royal Address by H. M. King Bhumibol Adulyadej On the Occasion of His Birthday Anniversary 5 December 1986)

Presently, countries around the world have been aware of environment problems. Environment laws have been enacted to control pollutions in each country. There are international conferences to solve and handle the rapid change in environment situation. Other than compulsory measures, voluntary measures relating to environment have been offered such as ISO 14001 Environmental Management System for entrepreneur who aims at protecting environment. The system has been announced by International Organization for Standardization as an option for the organization to use it for controlling and protecting pollution with more efficiently. This is an alternative of voluntary method for environment management in addition to laws or compulsory standards. [3]

In Thailand, National Education Act B.E. 2542 (1999) and the amendment (No.2) B.E.2545 (2002) requires schools to launch projects to promote education policy. Office of the Basic Education Commission establishes Educational Quality Assurance to align with the basic educational standard. It requires the school to have activities relating to environment learning within school that the environment learning can be performed continuously and sustainably. Presently, many schools employ ISO 14001 Environment Management to

reduce costs and pollutions in school. This can create good

image, ambiance, and environment in school. [14]

Although, there are many environmental management systems, the most popular system applied to many schools is the ISO 14001 standard. The environmental policy and procedure in ISO 14001 Environmental Management System are tools to protect the problems affecting environment. In addition, it promotes the economical utilization of resources and energies. The systematic procedure allows the continuous and sustainable development. [1]

A large school in Nakhon Pathom aims at performing its operations to align with the basic educational standard. This is to assure its quality that the school can provide good education for students under the surroundings with tidiness, cleanliness, shadiness, and niceness. Those surroundings can facilitate the student learning. It has an efficient energy and environment reserve. The school is a good model for communities and society. By these reasons, schools apply ISO 14001 Environment management system standard as the approach to manage environment systematically. The quality assurance regulated by Office of the Basic Education Commission, Thailand, requires the schools to maintain sustainable energy and resource reserve. [11]

Strategy is an important and essential for organizations because the organization uses the strategy for performing its operation and achieving its objectives. To establish the strategy, the organization is required to know status or condition of itself. In addition, the process that is appropriate to the organization is required for establishing strategies. There are many methods and techniques to analyze the organization condition and to establish the strategy. One of them is SWOT analysis that is popular and widely applied. The important and accurate information can positively affect SWOT analysis in three ways: 1) It supports the good vision; 2) Mission and objective are set up to align with the existing circumstance; and 3) Weakness, strength, opportunity, and threat are defined closely to the reality. This also includes SWOT Matrix, strategy establishment, and strategic plan. The strategy of the organization has four alternatives. However,

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they can be mixed in practice. Those alternatives are 1) SO STRATEGIES – the aggressive strategy that the internal and external key success factor is in the strength (S) and opportunity (O); the strategy is set up to achieve the objective when strength and opportunity are available, 2) WO STRATEGIES- the turnaround strategy that internal key success factor is in the weakness (W) but the external key success factor is in the opportunity (O); this strategy is to transform weakness to strength to perform the aggressive strategy when there is weakness but the opportunity is available, 3) ST STRATEGIES – the diversification strategy that changes threat to opportunity to take the proactive strategy when the operator has strength but the opportunity is not available because the internal key success factor is in the strength (S) but the external key success factor is in threat (T), and 4) WT STRATEGIES – the defensive strategy that changes to other performance model to achieve the objective because the internal key success factor is in the weakness (W) and the external key success factor is in the threat (T). The strategy establishment for schools is important. It is like choosing a key to solve the problem successfully. In addition, the aggressive strategy can be performed when the opportunity is available or it is to transform threat to opportunity for taking the aggressive strategy. Also, the other operation model can be used to achieve the objective. [12]

Based on the above discussion, the author suggests that ISO 14001:2015 Environmental Management System should be applied as a tool for protecting the environment problem in schools. Therefore, schools should establish their environmental management system in conformity to ISO14001:2015 for the sustainable environment reserve and environmental problem reduction. This research evaluates the school's ISO14001:2015 conformity by using gap analysis. In addition, this research evaluates the school's strategy to determine whether its strategy supports the sustainable environment reserve. [10]

The remaining of this research paper includes Section II Exiting literature and research question, Section II Data and research methodology, Section IV Results and discussion, and Section V Conclusion.

## II. EXISTING LITERATURE AND RESEARCH QUESTION

### A. Literature review

The existing literature shows that the environment problem in school is quite popular issue among researchers. [8] This is to examine the development of environmental management based on ISO 14001 for schools under the Office of Basic Education Commission. Results show that the environmental management based on ISO 14001 for schools under the Office of Basic Education Commission should have six steps including 1) general requirements, 2) environment policy, 3) planning, 4) Implementation, 5) Auditing, and 6) Review by the management. The evaluation result of environmental management based on ISO 14001 for schools under the Office of Basic Education Commission is appropriate and there is possibility to apply them for schools.[4] studies the implementation of GAP Analysis for the quality management improvement: The case study of Wealth Advance Company (1991) Limited. Results reveal

that customers have 25 requirements for the quality system evaluation. However, there are only 6 items that pass the examination and 19 remaining are failed. The score is only 61.6 out of 100 or C grade. The company requires improvement urgently. The company applies the quality management system ISO 9001 for improvement based on the customer's suggestion. The preparation of improved items is based on the standard and rules, and there are responsible people. After the improvement, the customer has more satisfaction that the score has been increased to 87.3 or A grade. The company can improve all 25 customer's requirements or 100 percent. Thus, gap for improvement is zero. Information technology group, Planning Division of Department of Health summarizes the gap analysis of host computer and connecting equipment. Results show that after gathering information and comparing information with ISO/IEC 27002:2005 (Code of practice for information security management) to perform Gap analysis by the evaluation criteria, the score of Department of Health is at level 4 (Fair at 61 – 80%). This level means that the security is at fair level. The department can maintain security at fair level. Some information is almost aligned with the standard. Thus, more improvement of security should be concerned. [3] study the implementation of environment management standard ISO 14001:2015 for small and medium enterprises: The case study of Product Center Service Company Limited. Results show that the gap between the company operating competency and standard requirements based on ISO14001:2015 includes the consideration of 1) the organization context in all aspects including both internal and external context, 2) the acquisition of requirements and expectations of stakeholders that are influencing the environmental management standard system, 3) risk from the organization context, requirement, and expectation of stakeholders, 4) the evaluation of impact on environment that is occurred from the organization process and activity, 5) the evaluation of conformity of agreement required by the relating law and agreement from the requirement and expectation of stakeholder, 6) the arrangement of all document systems that relate to the environmental management, 7) the following up the internal operation completely based on the requirement, and 8) the management review that covers all aspects that are required by the standard. If the organization performs based on the recommendation completely, the organization can perform based on the requirement of the environmental management standard system ISO 14001:2015. The organization will become the business organization that can protect environment that is consistent with laws. In addition, there is continuing development, including the entry to be the sustainable organization in the near future, [6] studies the implementation of expectation theory and the customer awareness (Gap analysis) and the survey of satisfaction of recipients using port service: The case study of Bangkok. Results show that Port is one activity that has important role for import and export business and international trade. It is an important mechanism for the economy system to be secured and growth. The important to improve Thai port to be the center of regional economy and to increase competitive potential in international trade, industry, and business, as well as the compliance with government policy to support and



promote export, this is an important mission of stakeholders especially Port. It requires to improving service quality for people in all aspects continuously. Thus, the survey of service quality is important for the development and improvement of service quality. This service quality study started to do survey in 2005. [5] Literature review about satisfactions of customers has been conducted. Consumer behavior and other relating theories are studied. Gap analysis and Performance-importance analysis have been employed for the analysis and evaluation of customers' satisfaction from Port service. The survey has been taken from 96 service recipients –shipping (ship and shipping company) and 240 service recipients who use port for merchandise (import-export and transportation Company). The response rate is 90.7 percent. Survey results have been analyzed with SPSS and qualitative analysis. The result shows that service recipients are satisfied by Port service. The score is 3.06. The service recipients for merchandises are also satisfied by Port service. The score is 3.07. The weighted average satisfaction score from the responded questionnaires of each sample group shows that both shipping and merchandise service recipients are satisfied by the service provided by Bangkok Port. The score is 3.07. This study also surveys and analyzes the satisfaction level of service recipients for activities and various service types. In addition, recommendations are provided for the management and relating parties. Research results can be used for improvement and development of service quality to raise the Port to be the international port in the future. [7]

This research questions are

1. Whether the school in Nakhon Pathom responses to the environmental reserve in conformity to ISO14001:2015.
2. Whether the school in Nakhon Pathom establishes its strategy to support the environmental research in accordance with ISO14001:2015.

### III. DATA AND RESEARCH METHODOLOGY

#### A. Data

This research selects a large school in Nakhon Pathom as a case study. The school is located in Nakhon Pathom Province of Thailand. For its general surroundings, there are five football and eight basketball fields. The school has garden with small and large tree, 30 Rais of lagoon, and 50 Rais of vegetable and fruit garden. There are 11 concrete buildings, 3 multi-purpose buildings, and 2 buildings. Areas in school have been set for different functions as follows.

1. Priest House – it is an institute to train young people to be priest. There are dormitories. It has itself discipline for its training. In the meantime, 200 students from grade 7 – 12 also study in the school.
2. Male School – The male school has offered education based on the government curriculum from grade 7 to 12. There are about 2,400 male students.
3. Female School – The female school has offered education based on the government curriculum from grade 7 to 12. There are about 1,800 male students.
4. Kindergarten School – It offers pre-school education. There are about 525 students.
5. English Language Center – The language center provides English education for students from kindergarten to

high school. It focuses mainly on conversation and listening skills. [2]

#### B. Research methodology

This research evaluates the ISO14001:2015 conformity in the school by analyzing gap analysis. The author collects questionnaires from two sample groups – the executive and students who are the school's steering committee of ISO14001:2015. The questionnaire includes 3 sections – general questions, perception and participatory in ISO14001:2015 conformity in school, and issues, barriers, and recommendation in terms of ISO 14001:2015 implementation for school. [11] The 5-scale rating is used in the questionnaire ranging from 1-no perception or less than 10% of participation to 5-high perception or more than 90% of participation.

Gap analysis is applied to analyze the obtained response. After receiving responses, the author analyzes and calculates scores for each question. Each question is evaluated and grouped into four aspects, including the school status, the school context, internal and external factors, and the performance of school's management. As a result, four activities from the evaluation analysis are summarized and scored with 25 points for each activity, including 1) Thinking, Planning, and Meeting within organization, 2) Having supporting evidence or practical formats prepared, 3) Taking action as planned, and 4) Having continuous monitoring, reviewing, and improvement. The total score is 100. The analysis results are presented in Item 1 – 7 as illustrated in Table I.

### IV. RESULTS AND DISCUSSION

Table I presents the result of ISO14001:2015 conformity from the large school in Nakhon Pathom. Based on ISO14001:2015, the author analyzes ISO14001:2015 conformity in 7 items as follows.

1. Organization context is presented in item 1.1–1.4. Scores are ranging from 25% to 75%. The lowest score is the understanding of organization context and internal and external factor consideration by the school. The school did not perform SWOT analysis for environmental management.
2. Leadership is presented in item 2.1-2.3. The score for all items is 75%, suggesting that the top management has concerned about the environmental management. However, the continuous improvement is highly recommended for the school.

TABLE I. GAP ANALYSIS RESULTS

ITEMS	QUESTIONS	ACTIVITIES FOR ASSESSMENTS: SCHOOL HAS PERFORMED THE FOLLOWING ACTIVITIES.				SCORE (%)	SUPPORTING EVIDENCE
		Thinking, Planning, and Meeting within organization	Having supporting evidence or practical formats prepared	Taking action as planned	Having continuous monitoring, reviewing, and improvement		
1.1 Organization context	<b>Understanding of organization context</b> The organization is required to identify internal and external factors relating to objectives that result in the ability to achieve the objectives based on the environmental management standard. Those factors can include environment factors that can or may have effects to the organization.	✓	×	×	×	25	The school prepared SWOT for the school environment but not for the environmental management ISO 14001.
1.2 Understanding of the requirement and expectation relating to the organization	<b>Understanding of the requirement and expectation relating to the organization – The organization is required to</b> (1) identify staff or organization relating to the system of environmental management standard	✓	✓	✓	×	75	Environment committee has been appointed and in 2016 with the clear responsibility but in practice it lacks of continuation.
	(2) identify requirements and expectations (conditions) for the relating staff and organization	✓	✓	✓	×	75	
	(3) strictly comply with the specified requirement and expectation for the conformity.	✓	✓	×	×	50	
1.3 Scope of the environmental management standard	<b>Scope of the environmental management standard</b> The organization is required to identify scopes and implementations of the environmental management standard under the scope defined by the organization. The organization is required to consider to performing the following issues.						The school defined scope but it is not sufficiently clear. SWOT analysis for the environmental management has not been done. Document about environment laws has been collected but it has not been verified whether the document covers all relating issues. The school prepared procedure for ISO 14001 committee. There was approach and plan for students' activities that are consistent to the environmental management system.
	1.1 internal and external factors as indicated in 1.1.	✓	×	×	×	25	
	1.2 the relating laws and regulations	✓	✓	×	×	50	
	1.3 organization's departments, functions, and physical scope	✓	✓	×	×	50	
	1.4 activities, products, and services	✓	✓	✓	×	75	
	1.5 authority, control capability, and activities.	✓	✓	✓	×	75	
1.4 The system of environmental management standard	When scope, activity, product and service probably influencing the environment significantly are specified, they are required to be included in the scope of the environmental management system. The scope is required to be documented and delivered to the relating parties.						The school prepared the manual of environmental management and the manual has been used since 19 March 2016. However, it lacks of the continuous improvement for the manual.
	<b>The system of environmental management standard</b> The organization must develop, implement, maintain, and improve the environmental management system continuously and the required processes and relevant parts related to the requirements of this international standard. This is to increase efficiency of the environmental management. The organization must consider knowledge and context of organization to develop and maintain the environmental management system. The organization must consider information obtained from No.1.1 and No.1.2 to create and maintain the environmental management standard system.	✓	✓	✓	×	75	
2.1 Leadership and Commitment	<b>Leadership and Commitment</b> The top management must present leadership and commitment relating to the environment management system by						The school's top management had leadership and commitment relating to the environmental management system. It showed responsibility on the efficiency of ISO 14001 system. There was approach and document plan signed by the management to be certain that the environment policy prepared was aligned with the strategy. It can be applied with ISO 9001. There are sufficient resources. Communication is aligned with regulations to confirm that the commitment can be achieved by this standard. However, it lacks of the continuous monitoring, verification, and improvement for all aspects.
	1) Showing responsibility for the efficiency of the environment management system	✓	✓	✓	×	75	
	2) Being certain that the environment policies and objectives have been prepared and aligned with the direct strategy and the organization context.	✓	✓	✓	×	75	
	3) Being certain that the environment management system can be integrated with the business process harmoniously.	✓	✓	✓	×	75	
	4) Being certain that the required resource for the environment implementation has been prepared sufficiently.	✓	✓	✓	×	75	
	5) Communicating efficiency of the important environmental management system that is aligned with the requirement specified in the environmental management standard system.	✓	✓	✓	×	75	
	6) Being certain that the environmental management standard system has been achieved as expected.	✓	✓	✓	×	75	
	7) Governing and supporting people to create the efficiency of the environmental management system.	✓	✓	✓	×	75	
	8) Supporting the continuous improvement.	✓	✓	✓	×	75	
	9) Supporting the management role to present leadership that it can be applied to activities and responsible areas.	✓	✓	✓	×	75	
	Remark: This international standard provides the boarder meaning of business, including the activity that is the main existing objective in the organization.						

TABLE I (CONTINUED.)

ITEMS	QUESTIONS	ACTIVITIES FOR ASSESSMENTS: SCHOOL HAS PERFORMED THE FOLLOWING ACTIVITIES.				SCORE (%)	SUPPORTING EVIDENCE
		Thinking, Planning, and Meeting within organization	Having supporting evidence or practical formats prepared	Taking action as planned	Having continuous monitoring, reviewing, and improvement		
2.2. Environmental Policy	<b>Environmental Policy</b> The top management must develop, implement, and maintain the environmental policy under the scope specified in the environmental management standard system. The followings must be considered. 1) It must be appropriate in terms of 1.1) That the policy must be appropriate with the organization objective. 1.2) The context and nature of organization, size, the impact of activities on environment, products, and services. 2) It must identify frame or scope for the objectives of environment. 3) It must present commitment to protect environment, covering the procedure to protect pollution occurrence and important issues based on the organization context. 4) It must present commitment to follow the agreement (laws and relating regulations). 5) It must present commitment to improve continuously about the environment management system to increase the efficiency of organization's environment. 6) The environmental policy must be 6.1) Prepared in the format of information document. 6.2) Delivered to all people working in the organization and people under the organization governance to know about the environmental policy. 6.3) Prepared for stakeholders. <i>Remarks: The commitment to protect environment probably includes the increase in efficiency of using environment sustainably, greenhouse gas management to reduce and adjust for the impact of weather changes, the protection of biodiversity and ecosystem, or other important issues.</i>						Top management signed on the environment policy document in 2016. The policy is "determination, development, maintenance of environment, and establishment of readiness system to support learning organization." This is appropriate for the school's objective and context. However, the continuing improvement is still required. There was framework for setting objectives. This implies that the management has commitment to protect environment. Risk evaluation and plan for each aspects had been prepared. This implies that the management has followed its commitment. All legal document had been collected but it still lacks of the continuous improvement.
2.3 Roles of organization, responsibilities, and authorities	<b>Roles of organization, responsibilities, and authorities</b> The top management must be confident that authority and responsibility have been identified, directed, and communicated within the organization to facilitate the efficiency of environmental management. The top management must delegate authority and responsibility to 1) Be sure that the environmental management standard system has been complied with the regulations in this environmental standard. 2) Report performance and efficiency of the environmental management standard system to the top management.						Top management had confidence that authority and responsibility had been identified, assigned, and communicated within the school. This is to have the efficient environmental management. The management signed on the document to be certain that the standard system is conformed to the regulation and the management has been reported about issues. However, it still lacks of continuous improvement.
3.1 Planning The identification of risk, and threat (Impact) and opportunity of the event to be occurred	<b>General</b> The <b>organization</b> must establish regulations and implement as well as maintain the necessary process that can be found in No.3.1 – No. 3.4. For the planning of the environmental management standard system, the organization must consider about the followings. 1) Issues as specified in No. 1.1. 2) Regulations specified in No. 1.2. 3) Scope of the environmental management standard system. The organization must identify risk and opportunity of improvement that are related to the environmental problems and issues (3.1), the conformity with the agreement (3.2), and other issues specified in 1.1 and 1.2 that are required to be met. - To assure that the environmental management standard system is successful as targeted. - To protect and reduce undesired impacts and the possibility of organization's external environment that can affect the organization's internal. - To achieve the continuous improvement. Within the scope of the environmental management standard system, the organization must specify the possibility of emergency events and the impact of them on environment. The organization must keep information document. - Risk and opportunity of risk must be identified. - The required process in No.3.1 – No.3.2 that cannot be avoidable must be achieved as planned. The organization must consider the requirements in No.1.2. In addition, the organization must be confident to specified information document based on the necessary scope. This is to be sure that the process has been implemented according to the plan.						The school planned for the environmental management in 3 aspects. The plan for item 2 and 3 had been documented and implemented. SWOT analysis for ISO14001 is still required for item 1. All three aspects lack of the continuous improvement. For risk and opportunity, the school prepared document for environment issues and the significance evaluation. The evaluation of risk and management plan had been prepared in the document format and performed by the ISO 14001:2015 environmental committee. However, the document format is still required. It has not been implemented.

TABLE I (CONTINUED.)

ITEMS	QUESTIONS	ACTIVITIES FOR ASSESSMENTS: SCHOOL HAS PERFORMED THE FOLLOWING ACTIVITIES.				SCORE (%)	SUPPORTING EVIDENCE
		Thinking, Planning, and Meeting within organization	Having supporting evidence or practical formats prepared	Taking action as planned	Having continuous monitoring, reviewing, and improvement		
3.2 The significant environment problem	<p><b>The significant environment problem</b></p> <p>Within the scope of the environmental management standard system, the organization must specify environment problems and the impact of activities, products, and services that the organization can control or influence to control on environment. The organization must concern about the product life cycle. The organization must perform as follows.</p> <p>1) Modification and planning for new development, activity, product, and service</p> <p>2) Identifying problems in normal and emergency situations that could be occurred.</p> <p>The organization must identify the significant environment problem or the problem of environment that has opportunity to be occurred significantly. Criteria must be established. In addition, the organization must communicate about the significant environment problem to other units and every level as well as relating functions.</p> <p>The organization must maintain the information documents for</p> <ul style="list-style-type: none"> <li>- The environment problem and impact of such problem.</li> <li>- Criteria to identify the significance of environment problems.</li> <li>- The significant environment problem</li> </ul> <p>Remarks: The significant environment problem can create the negative impact on environment (threat) but if it is the positive impact, it will create benefits (opportunity).</p>	✓	✓	×	×	50	The school prepared procedure for all issues in the document. However, it has not been implemented. The school identified environmental issues and influence of activities, products and services that can be controlled by the school. However, it lacks of the consideration about the product life cycle. The school collected the document.
		✓	✓	×	×	50	
		✓	✓	×	×	50	
		✓	✓	×	×	50	
		✓	✓	×	×	50	
3.3 Conformity with commitment	<p><b>Conformity with commitment</b></p> <p>The organization must do the followings</p> <p>1) Identifying and accessing the commitment relating to the specified environment problem.</p> <p>2) Explaining the implication of commitments within the organization.</p> <p>3) Taking the commitments to be listed that when they will be implemented, maintained, and improved continuously of the environment management system.</p> <p>The organization must prepare and maintain information document relating to the conformity of identified commitments.</p> <p>Remarks: The conformity of commitments can affect risk and opportunity of organization.</p>	✓	✓	×	×	50	The school analyzed laws (commitments) and the conformity. However, the analysis has not been used, monitored, or improved about the use of those commitments.
		✓	×	×	×	25	
		✓	✓	×	×	50	
3.4 Action plan	<p><b>Action plan</b></p> <p>The organization must plan the followings.</p> <p>1) The action plan for the following tasks</p> <ul style="list-style-type: none"> <li>- The significant environment problem</li> <li>- The conformity with commitments</li> <li>- Risk and opportunity identification in 3.1.</li> </ul> <p>2) Explain the followings</p> <ul style="list-style-type: none"> <li>- Collaboration and implementation of the environment management standard system (No. 3.2 Requirement 4, 5, and 6.2) or other business processes.</li> <li>- Evaluation the efficiency of action plan.</li> </ul> <p>To develop the environment objective, the organization is required to consider about the potentiality of technology, finance, organization culture, operation, and business requirements.</p>	✓	✓	×	×	50	The school had action plan for environmental issues and analyzed the conformity to laws. Action plan is in document format. There was no document about the implementation of ISO 14001:2015 procedures. The efficiency of implementation had not been evaluated.
		✓	✓	×	×	50	
		✓	✓	×	×	50	
		✓	×	×	×	25	
3.5 Environmental objectives, planning, and achievement	<p><b>Environmental objectives</b></p> <p>The organization must establish the objective of environment in different levels and function based on the appropriateness. It must consider about the significant environment problem and the conformity with related commitments. This is to determine relating risk, threat, and opportunity.</p> <p>The characteristic of environment objectives must be as follows.</p> <p>1) Conformity with the environmental policy.</p> <p>2) Measurable in terms of numeric and there is possibility.</p> <p>3) Requiring monitoring</p> <p>4) Requiring communication</p> <p>5) Requiring updates as appropriate</p> <p>The organization must prepare information and documents and maintain the document of environment objectives.</p>	✓	✓	×	×	50	The school defined environmental objectives for different levels and functions as appropriated. It defined according to the environmental policy. The significant environment problem must be considered. It must be conformed to relating commitments. Risk relating to threat and opportunity must be analyzed.
		✓	✓	×	×	50	
		✓	×	×	×	25	
		✓	×	×	×	25	
		✓	×	×	×	25	

TABLE I (CONTINUED.)

ITEMS	QUESTIONS	ACTIVITIES FOR ASSESSMENTS: SCHOOL HAS PERFORMED THE FOLLOWING ACTIVITIES.				SCORE (%)	SUPPORTING EVIDENCE
		Thinking, Planning, and Meeting within organization	Having supporting evidence or practical formats prepared	Taking action as planned	Having continuous monitoring, reviewing, and improvement		
3.6	<b>Planning and implementing to achieve the objectives</b>						
	For planning to achieve the objective of environment, the organization must perform the followings.						
	1) What is to be done?	✓	✓	×	×	50	The school has plan for the establishment of environmental objectives as shown in the document. All items except item 4 –when the objective will be achieved?- were included in the document.
	2) What resources are required to achieve the objective?	✓	✓	×	×	50	
	3) Whose responsibility?	✓	✓	×	×	50	
	4) When the objective will be achieved?	✓	×	×	×	25	
	5) How to evaluate the performance? It also includes the key performance indicator for the follow-up process and the measurement for the achievement of specified environment objectives. (See Requirement No. 6.1)	✓	✓	×	×	50	
	The organization must consider about the timeline of action plan to achieve the objective of environment. This action plan can be integrated with the business process.						
4.1	<b>Resources</b>						
Support function	The organization must establish and prepare for necessary resources for the system development, implementation, maintenance, and improvement continuously for the environmental management standard system.	✓	✓	✓	×	75	The school defined and prepared necessary resources for the system development.
4.2	<b>Capability</b>						
	The organization must do the followings.						
	1) Specifying the capability of required staff who controls the impact of environment. This is to maintain the efficiency of the environmental management standard system and commitment.	✓	✓	✓	×	75	The school defined personal capability to control the environment impact and legal compliance. However, personal has not yet been trained about such knowledge and implementation.
	2) Being certain that those staff members have basic and appropriate skills such as education, training, or experience.	✓	×	×	×	25	
	3) Specifying the necessity for training relating to the environment problems and issues as well as the environmental management system.	✓	×	×	×	25	
	4) If it is required, the organization must define the necessary capability and evaluate the performance.	✓	✓	×	×	50	
	Remark: Performance includes organizing training program, consultation, suggestion, or job distribution. This is to create certainty for staff members and sub-contract staff.						
4.3	<b>Awareness</b>						
Awareness	Staff who works under the organization's control must be aware of the followings.						
	1) The environment policy.	✓	✓	×	×	50	Personal working under the school's control still lacked of awareness for all items. However, it started to think, plan, and prepare some document.
	2) The significant environment problem and impact as well as the potential impact of operation.	✓	✓	×	×	50	
	3) The attention to efficiency of the environmental management system. It also includes benefits that probably can improve the better environmental efficiency.	✓	✓	×	×	50	
	4) The awareness of the consequences that the environmental management standard system and commitments are not followed.	✓	✓	×	×	50	
4.4	<b>General</b>						
Communication	The organization must plan, comply, and maintain the necessary process of internal and external communication that is aligned with the environmental management system. This also includes						The school had plan, implementation, and maintenance that were essential for the internal and external communication. They were in document format and conformed to all 4 items of environmental management system. However, it lacks of monitoring and continuous improvement. The school showed responsibilities about communication under the environmental management. This is evidenced in the paper document.
	1) What is to be communicated?	✓	✓	×	×	50	
	2) When is to communicate?	✓	✓	×	×	50	
	3) Whom is communicated with?	✓	✓	×	×	50	
	4) How is to communicate?	✓	✓	×	×	50	
	When planning for communication, the organization must consider about the following communications.						
	- The responsibility to follow the commitments.	✓	✓	×	×	50	
	- Being certain that information about environment to be communicated is conformity to the environmental management system and it is accurate.	✓	✓	×	×	50	
	The organization must present responsibility for communication under the environmental management system. In addition, the organization must maintain the evidence and document of communication appropriately.						

TABLE I (CONTINUED.)

ITEMS	QUESTIONS	ACTIVITIES FOR ASSESSMENTS: SCHOOL HAS PERFORMED THE FOLLOWING ACTIVITIES.				SCORE (%)	SUPPORTING EVIDENCE
		Thinking, Planning, and Meeting within organization	Having supporting evidence or practical formats prepared	Taking action as planned	Having continuous monitoring, reviewing, and improvement		
4.5 Internal communication	<b>Internal communication</b> For the environmental management system, the organization must perform the internal communication as follows. 1) Communication in different levels and functions within the organization appropriately, including the changes that probably affect the environmental management system. 2) To be certain that the communication process is delivered to staff who is under the control of organization, including the continuous improvement.	✓	✓	×	×	50	The school mentioned about the environmental management system. The school had internal communication by preparing document of all 2 items. However, they have not been implemented and there is no continuous review for such document.
		✓	✓	×	×	50	
4.6 External communication	<b>External communication</b> The organization must perform the communication of information that is complied with the environmental management standard to the external party. The communication process specified in the commitment must be identified (Relating laws and regulations).	✓	✓	×	×	50	The school prepared document of external communication. However, it has not been used or reviewed continuously.
4.7 Document	<b>General</b> The organization performing the environmental management system must do the followings. 1) Document that is required by this international standard. 2) Document that is required by the organization for creating the efficiency of the environmental management system. Remark: Scope of document in the environmental management system can probably be different among organizations. This is depended upon: - The organization's size, process, product, and service. - The necessity to active the commitments. - The complexity of processes and the relation among those processes. - The capability of people who work under the control of organization.	✓	✓	×	×	50	The school followed item 1 and 2 of the environment management. However, there is no implementation and continuous review.
		✓	✓	×	×	50	
4.8 Preparing new document and updating	<b>Preparing new document and updating</b> When preparing or updating document, the organization must be certain that: 1) The definition and explanation must be clear (title, date, author, reference number, and etc.) 2) Format (i.e. language, computer version, picture) and other media including paper or computer files. 3) Review and approval document must be appropriated and sufficient.	✓	×	×	×	25	The school had thought and planed for renewing and updating the document. However, this process has not yet been in paper document. In addition, there is no implementation, and monitoring for these issues.
		✓	×	×	×	25	
		✓	×	×	×	25	
4.9 Control of document	<b>Control of document</b> The document provided by the environmental management system and this international standard must be controlled to be certain that: 1) The document has been prepared appropriately based on the requirement of place and time. 2) There is protection scheme for loss and misuse of document and important information. Loss of document can be from dishonesty. For the control of document, the organization must identify or indicate to have the following activities as appropriate. - Distribution, accessibility, usage, and recall. - Storage, maintenance, and the storage to protect the document fading. - The control for changes (Control by the document number). - Period for the document storage and destroy. Document from outside parties specified by the organization that it is required for planning and operation of the environmental management system must be specified appropriately and controlled.  Remarks: The accessibility of document covers only the permission to review the document or the permission to review and change the document.	✓	✓	×	×	50	The school controlled document by preparing it in paper and applying both item 1 and 2 for the document control system. However, they have not been implemented and improved continuously.
		✓	✓	×	×	50	
		✓	✓	×	×	50	
		✓	✓	×	×	50	
		✓	✓	×	×	50	
		✓	✓	×	×	50	

TABLE I (CONTINUED.)

ITEMS	QUESTIONS	ACTIVITIES FOR ASSESSMENTS: SCHOOL HAS PERFORMED THE FOLLOWING ACTIVITIES.				SCORE (%)	SUPPORTING EVIDENCE
		Thinking, Planning, and Meeting within organization	Having supporting evidence or practical formats prepared	Taking action as planned	Having continuous monitoring, reviewing, and improvement		
5.1 Implementation	<p><b>Implementation and control</b></p> <p>The organization must plan, implement, and control the process required by the environmental management standard system and the implementation must be aligned with the requirement No. 3.1 and 3.2, that</p> <ol style="list-style-type: none"> <li>1) Setting criteria for the control and planning process</li> <li>2) Implementing the control measures of process that must be complied with the criteria of the process to control for the deviation from the environmental policy, environmental objective, law conformity, and other relating regulations.</li> </ol> <p><b>Remarks: The control includes the engineering control measure and work procedures and regulations that are applied in the order of management (the removal and substitution of management). One or more methods can be applied together.</b></p> <p>The organization must control for changes in action plan and review the output received and the unexpected changes. The organization must consider them for the measure to control for potential damages as required.</p> <p>The organization must be certain that the process of subcontractors is controlled directly or indirectly. The level of direct or indirect control to be applied for the process must be clearly indicated in the environmental management standard system.</p> <p>To comply with the life cycle analysis, the organization must perform the followings.</p> <ol style="list-style-type: none"> <li>1. Identify the measure of environment for purchasing and hiring products and services as appropriate.</li> <li>2. Develop the control measure based on the environmental management and consider the design process for development, product distribution, usage, and the treatment for the end of product and service as appropriate.</li> <li>3. Communicate the relating regulation of environment to product deliverers and subcontractors.</li> <li>4. Consider the requirement to prepare for information relating to the significant environment problem during the shipping of products and services, usage, and the treatment for the end of products and services.</li> </ol> <p><b>Remarks: The organization must perform to assure that the document has been retained under the scope and the process has been performed under the scope of plan.</b></p>	✓	✓	×	×	50	<p>The school had action plan and control based on the environmental management system. They are in paper document.</p> <p>The organization implemented the process control measures in accordance with the process criteria to prevent deviations from the environmental policy, objective, legal conformity, and other relating issues. This process is showed in paper document. However, it has not yet been implemented and reviewed continuously.</p>
		✓	✓	×	×	50	
		✓	×	×	×	25	
		×	×	×	×	0	
		✓	×	×	×	25	
		✓	×	×	×	25	
5.2. The preparation for the emergency response	<p><b>The preparation for the emergency response</b></p> <p>The organization must be certain that the regulation for the emergency response and opportunity for the accident occurrence has been prepared and implemented. The organization must perform the followings.</p> <ol style="list-style-type: none"> <li>1. Preparing for the response by planning activities to protect or relieve the negative impact of emergency situations on environment.</li> <li>2. Taking action to respond the occurred emergency event and accident.</li> <li>3. Reducing impact of those emergency events to the level that can be control the emergency situation and accident as well as the other potential impact.</li> <li>4. Testing regulations appropriately and periodically.</li> <li>5. Reviewing changes in regulations as required, in particular after the occurrence of emergency or accident or after the test.</li> <li>6. Providing relating information and training to prepare for the response as appropriate to stakeholders and staff who is working under the control of organization.</li> </ol> <p>The organization must retain information document within the required scope that it is to assure that the process has been performed as planned.</p>	✓	✓	×	×	50	<p>The school prepared document for the emergency procedure in item 1 – 5. However, it has not yet been implemented and reviewed continuously. For item 6, the school had only thought and plan.</p>
		✓	✓	×	×	50	
		✓	✓	×	×	50	
		✓	✓	×	×	50	
		✓	✓	×	×	50	
		✓	×	×	×	50	

TABLE I (CONTINUED.)

ITEMS	QUESTIONS	ACTIVITIES FOR ASSESSMENTS: SCHOOL HAS PERFORMED THE FOLLOWING ACTIVITIES.				SCORE (%)	SUPPORTING EVIDENCE
		Thinking, Planning, and Meeting within organization	Having supporting evidence or practical formats prepared	Taking action as planned	Having continuous monitoring, reviewing, and improvement		
6.1 Performance assessment	<p><b>General</b></p> <p>The organization must monitor, measure, analyze, and evaluate the environment competency. The organization must perform the followings.</p> <p>1. Identify what are important issues to be measured and monitored.</p> <p>2. The monitoring, measurement, analysis, and evaluation methods are identified to assure that the results obtained are accurate.</p> <p>3. The organization must use appropriate indicators for the comparison measure to evaluate the organization's performance efficiency.</p> <p>4. Timeframe for monitoring and measurement must be set.</p> <p>5. Timeframe for analysis and evaluation must be set.</p> <p>The organization must perform to assure that the monitoring and measurement tools must be calibrated and maintained appropriately.</p> <p>The organization must assure that the evaluation is operated efficiently and the evaluation result is submitted to the administrative committee to evaluate the efficiency of environmental management system.</p> <p>The organization must assure that there is evidence document of monitoring, measurement, analysis, and evaluation. The organization must communicate internally and externally about information relating to the efficiency of environmental management and establish the method of communication based on the commitment specified in the contract (relating laws or regulations).</p>	<p>✓</p> <p>✓</p> <p>✓</p> <p>✓</p> <p>✓</p>	<p>×</p> <p>×</p> <p>×</p> <p>×</p> <p>×</p>	<p>×</p> <p>×</p> <p>×</p> <p>×</p> <p>×</p>	<p>×</p> <p>×</p> <p>×</p> <p>×</p> <p>×</p>	<p>25</p> <p>25</p> <p>25</p> <p>25</p> <p>25</p>	The school had some meeting. There is no implementation and continuous review for all items.
6.2 Conformity evaluation	<p><b>Conformity evaluation</b></p> <p>The organization must plan and apply the process of conformity evaluation for commitment. The organization can perform the followings.</p> <p>1. Identify the frequency to evaluate the conformity of commitment in contract (laws and relating regulations).</p> <p>2. Evaluate the conformity and provide measure for amendment or protection if required.</p> <p>3. Maintain knowledge and understanding of situation to evaluate the conformity of commitment in contract (laws and relating regulations).</p> <p>The organization must retain information document as evidence for such conformity evaluation.</p>	<p>✓</p> <p>✓</p> <p>✓</p>	<p>×</p> <p>×</p> <p>×</p>	<p>×</p> <p>×</p> <p>×</p>	<p>×</p> <p>×</p> <p>×</p>	<p>25</p> <p>25</p> <p>25</p>	
6.3 Internal Assessment	<p><b>General</b></p> <p>The organization must have internal assessment according to the plan and the appropriate time period indicated in the environmental management system.</p> <p>1. To be consistent with</p> <p>- The organization's regulation for the environmental management system.</p> <p>- The regulations specified in this international standard.</p> <p>2. To create efficiency and maintain the environmental management system.</p>	<p>✓</p> <p>✓</p> <p>✓</p>	<p>×</p> <p>×</p> <p>×</p>	<p>×</p> <p>×</p> <p>×</p>	<p>×</p> <p>×</p> <p>×</p>	<p>25</p> <p>25</p> <p>25</p>	The school had meeting about the internal assessment for some conformity. However, there is no paper document, implementation and continuous review.
6.4 Internal assessment plan	<p><b>Internal assessment plan</b></p> <p>The organization must plant to implement and maintain the internal evaluation assessment that includes frequency, procedure, responsibility, planning, and internal assessment result reporting.</p> <p>When preparing the internal assessment plan, the organization must consider it with the working process that is important for the environmental impact, risk relating to the threat and opportunity, and the previous assessment result.</p> <p>1. Indicate criteria and scope for each assessment.</p> <p>2. Select assessor and assessment to assure that the assessment procedure is concrete, unbiased, and accurate.</p> <p>3. Process to assure that the assessment result is reported to the management level.</p> <p>The organization must retain document evidence of the assessment program and results.</p>	<p>×</p> <p>×</p> <p>×</p>	<p>×</p> <p>×</p> <p>×</p>	<p>×</p> <p>×</p> <p>×</p>	<p>×</p> <p>×</p> <p>×</p>	<p>0</p> <p>0</p> <p>0</p>	



[illegible]

3. Planning is presented in item 3.1–3.6. Scores are ranging from 0 – 75%, suggesting that the school is required to plan for the environmental management. The school has completely failed to manage collaboration and implementation of the environmental management standard system.

4. Support is presented in item 4.1–4.9. Scores for support are ranging from 25%-75%. However, there are only two items - resources preparation and staff capability that their scores are 75%. The results suggest that although the school has prepared for resources to support the environmental management, the school must consider other supporting factors such as awareness and communication. The school must have up-to-date of document and document control.

5. Operation is presented in item 5.1–5.2. Scores for these items are ranging from 0 – 25%. The results suggest that the school has failed to operate the environmental management system especially for the measurement of control.

6. Performance evaluation is presented in item 6.1–6.5. Scores for the performance evaluation are very low relative to the other six topics. Because the school has failed to implement the environmental management system, the performance evaluation, then, cannot be performed properly.

7. Improvement is presented in item 7.1–7.2. Scores for these items are from 0 – 25%. The school is required to perform improvement and continuation of enhancement for the environmental management system.

Overall results suggest that the school is likely to have resources for the implementation of environmental management system. The school prepares SWOT analysis but it fails to do SWOT analysis for the environmental management system. As a result, the school is failed to implement the environmental management system properly.

## V. CONCLUSION

This research conducts the ISO14001:2015 conformity in a large school in Nakhon Pathom, Thailand. This research attempts to respond two questions. For the first question, it is to determine whether the school to the environmental reserve in conformity to ISO14001:2015. The obtained result suggests that the school is still required to improve significantly in many aspects especially in terms of planning and the implementation of the environmental management system in the school. The second question is to determine whether the school establishes its strategy to support the environmental research in accordance with ISO14001:2015. The result suggests that the school fails to have strategy for the environmental management system. The school should consider in terms of preparing SWOT analysis as a tool for the strategy of its environmental management system.

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# Participation and awareness of staff in the office that apply green offices standard under the principle of grounded theory

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## Abstract

This research aimed to do the following: 1) To study the participation and awareness of staff in environmental management within an office environment. 2) To study the variables describing the participation and awareness of staff in environmental management of staff within a “Green Office” environment using grounded theory. The study indicated that participation of staff in environmental management within green offices was high. The main variables that were found were the characteristics of the organization, executive variables and the characteristics of staff in the organization. The key supporting factors that were found were the vision, policy, guidelines, roles and authority of the staff in environmental management. The vision, concept and commitment to the development of environmental management work of the senior staff was also found to be vitally important for the implementation of environmental management. The awareness of the importance of environmental management systems among staff was also found to be one of the key factors in the success of a “green office”. The main contributing factor in success is to collaborate in order to solve environmental problems. The environment in the office is cleaner than ever. Awareness of the role of environmental management is everyone's responsibility. Human resources are important for effective environmental management. Implementing the “Green Office” environmental management system was seen to create a good image for the organization.

**Keyword: Participation, Awareness, Green Office**

## I. INTRODUCTION

The operation of the office requires the use of energy resources and environmental impacts. Both waste and waste water. Let's have a release. Greenhouse gas emissions are the main cause of climate change and major global environmental crisis. And it affects the whole country and around the world. [1].

Green office environmentally friendly it promotes the potential of energy and environmental resources management in the office. Green Procurement supports procurement, procurement, and environmental services to maximize resource use. Energy efficient and effective. Good environmental management. And to raise the standard of office to be more environmentally friendly. The composition of the green office. Apply the concept of ISO14001 environmental management system, greenhouse gas management. Environmentally-friendly waste minimization. Pollution Prevention is a systematic way of addressing environmental management in the office. [1] The key principle of the “Green Office” is to change the behavior in the office without the expense. Or at the least cost. To reduce energy consumption It also promotes environmentally friendly activities such as reducing waste by reducing use, reuse, recycling. Reduce and eliminate harmful chemicals. [2]

Implementation of the “Green Office” on the provisions of the law. It was not legal. Or other requirements Controlling the impact or compliance with the law. Consciousness or environmental awareness will help the business to progress as well. Management has good management in the business. But most of the problems are found, although the staff in the organization will have the intention and initiative in the field of environmental management. But the pressure from the core business of the organization. This will result in insufficient time and resources for research. To conduct environmental operations. And although there is a lot of information about

environmental management, there is a lack of knowledge and expertise in the use of knowledge. [2]

From the implementation of the green office project. The problem of participation and awareness of environmental management in the office. What is the benefit of being a Green Office? The research participants were aware of the involvement and awareness of environmental management within the office. Attending the office Green Office using mixed methods, both qualitative and quantitative research. Based on grounded theory. The Green Office benefits both the direct benefit of reducing office expenses from power cuts. Paper consumption and so on. Reduce air and water pollution. Cut down trees Creating awareness and participation in environmental issues. The staff is proud and cheerful. Good corporate image. In the present, the use of virtue or good is the way to conduct business. Can increase revenue and market share. Green office projects not only make people proud because they are involved. But organizations can also earn revenue from customers considering purchasing products and services from socially responsible organizations. This results in more profit for the organization. And the benefits to consumers of low quality products. [2]

## II. OBJECTIVE

- 1) To study the participation and awareness of staff in environmental management within an office environment.
- 2) To study the variables describing the participation and awareness of staff in environmental management of staff within a “Green Office” environment using grounded theory.

## III. CONCEPTUAL FRAMEWORK

A study of participation and awareness of staff in environmental management within the offices participating in the Green Office Project based on founding theories. The environmental management information collected within the

unit is the participation and awareness of staff. And the factors that contribute to the heavy involvement and awareness of the staff. By reviewing the literature. And the interview is the internal factors include the size of the organization. Location of Organization type and environmental management. And external factors. Economic composition Society and Culture Law and politics, technology and the natural environment. The data was analyzed by foundation theory. To understand the variables explaining the involvement and awareness of staff in environmental management of staff within the Green Office. (Figure 1)

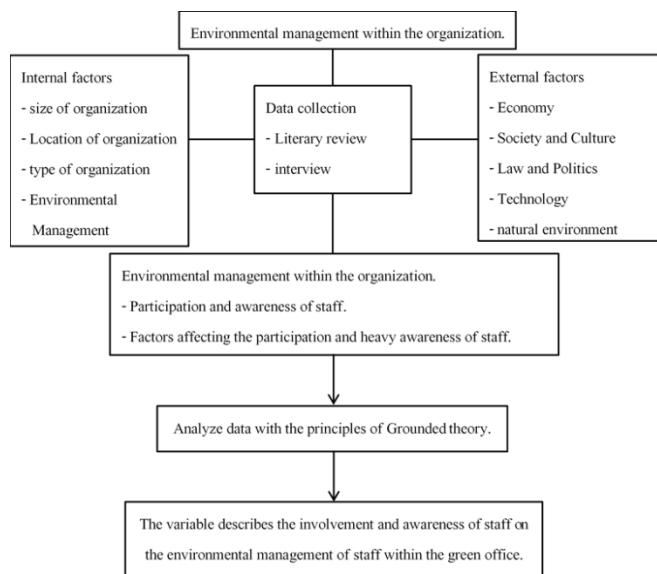


Fig. 1 Conceptual framework

#### IV. LITERATURE REVIEW

##### Green Office Concept

Green office It is an environmental management system for is a tool to reduce costs and impact on the environment. Encourage employees to follow better everyday practices for business and the environment. As well as reducing greenhouse gas emissions. Promoting Sustainable Living And reduce the climate change. [3] And Green Office that offices and activities. The office is the least affected by the environment. By using valuable resources and energy. Effective waste management approach. Including the selection of materials, office equipment that is environmentally friendly. And it is important to release the greenhouse gas emissions. [2]

##### Participation Theory

Development of a participatory process to the public is involved in the development collaborator decided to join together their own solution. Highlighting the involvement of the public to get involved actively. The creativity and the expertise of the public in solving problems with the use of appropriate technology and results of operations of the organization and the staff involved. [4] And participation the public as the development process is to join an enthusiastic and energetic people in the decision-making process. The target of the social Align resources to achieve goals and to comply with the plan or project in Indonesia voluntarily. [5] The meaning of people's participation varies from social and

political context. In the past, people's participation. It often means political participation. At present, the society attaches importance to direct democracy and self-governing democracy. Public Participation The principle of public participation must be inclusive, from the beginning to the end, not the organization. The one-time participation method consists of (1) starting from self-consciousness and assuming their responsibilities. (2) Think together about what is problematic. What are the causes and priorities of the problem? (3) Jointly plan how activities will be organized, what projects will be divided, how much budget will be spent, and who will be. (4) To participate in the activities of the public, the people must participate in the activities with full willingness, knowledge and ability. The public must be involved in the examination of the problems and to find solutions together to complete a task or mission can be achieved by the target (6) Total beneficiaries. It may not necessarily be in the form of money, objects, but may be happy, satisfied, in a condition of well-being. [6]

##### Awareness Theory

Awareness refers to the expression of feelings, opinions, consciousness, as a condition in which a person understands and evaluates a situation that occurs about himself through time, events, experiences, or circumstances. It is a factor that makes people realize. [7] And awareness is behavior that expresses responsibility for one thing. Or one event The emotions, attitude, values. Likes or dislikes, good or bad, from the evaluation of the individual's stimulus. [8]

##### Grounded Theory

Grounded Theory Founded by Glaser and Strauss in 1967, the first published Grounded theory book, The Discovery of Grounded Theory, is a study of phenomena or social conditions. Place of birth Then the system was collected and analyzed systematically. To create an inductive statement about what is happening, Glaser and Strauss say that the theory that is made must be as consistent as possible. [9] Grounded theory is a guideline for qualitative research that emphasizes interpretation. Phenomenon related to attitudes, beliefs, feelings, cultures, and human behaviors. There are several ways to store data. The way in all the incidents. Researchers question the research or hypothesis of research during the research process, based on direct observation data. And use analytical thinking. And to interpret the findings reasonably. To find the variables associated and it comes out as a rule. This approach is based on an inductive approach. [10]

#### V. METHODOLOGY

The foundations of the grounded theory were analyzed by qualitative and quantitative study. The research method is divided into 3 phases: phase 1: qualitative research, phase 2: quantitative research. and phase 3: mixed-methods research (Figure 2)

Phase 1: Qualitative research to study and understand the variables of participation and awareness of staff in environmental management of organizations participating in the Green Office. From the study of documents. Theories and related research to determine the scope and scope of the subject. Then the information obtained from the study of

documents. Create question for interview. Researchers use qualitative research methods to collect information in this phase. 1) Staff interviews and 2) Interviews with interviewees. Participation and awareness of environmental management. It can also be developed as a tool for quantitative studies.

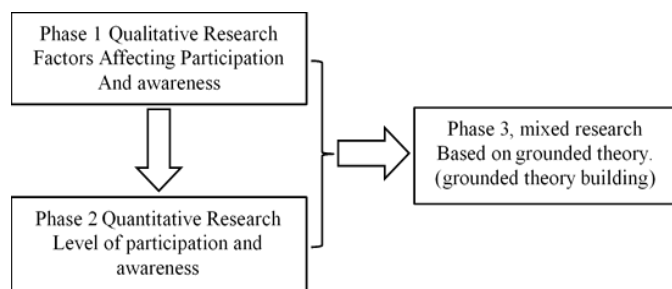


Fig. 2 The research process is divided into 3 phases

Phase 2: Quantitative research study was conducted to investigate the level of participation and awareness of staff in environmental management of the participating organizations. The Green Office, based on information from the first phase of research, developed the research tools. Quantitative aspects include information about the factors that contribute to the involvement and awareness of the environmental management of the participating organizations. The first phase of the study was a questionnaire measuring the level of participation and awareness of the environmental management of staff. It was a questionnaire showing the actions or interactions between staff. With the environmental management system within the organization. When participating in the Green Office project, it is the nature of the questions that the staff perceive as contributing to their involvement and awareness in environmental management.

Phase 3: Mixed-method research to apply the grounded theory to participatory learning and environmental management awareness of participating organizations. The green office is the use of information. The results of the qualitative analysis in the first phase and the results of the analysis in the second quantitative study were analyzed. The results of the analysis are based on qualitative data analysis. Then check the information. The expert is the inspector.

## VI. RESULT

staff participation in environmental management within the office participating in the “Green Office” project

Most of the staff of all organizations. Comments to the effect of organizational variables on the participation of environmental management staff under the most green office project. (More than 90%), especially in the formulation of vision, policies and guidelines for environmental management. The role and authority of staff in environmental management are clear. When comparing the results, the variables were classified by the general characteristics of the sample. The results of the environmental management work under the “green office” project were compared by type of organization. Gender comparison Age comparison by education level Compare by Job title comparison of time worked in current position Comparison of debt level Comparison by

environmental training. According to the environmental news, private sector employees (100%), state enterprises (98.31%), male employees (96.02%), Most staff with a doctoral degree (100%). Most of the staff who have been in the current position for no more than 1 to 10 years (96.04%). (96.97%). Most of the employees were trained in environment (97.06%) and most of the people who received environmental information (96.22%). Significant results of the Environmental Management Bureau under the most green office.

### staff awareness on environmental management within the office attending green office

Most of staff of all organizations when comparing the results of the study, the factors were classified according to the general characteristics of the sample. The effect of environmental management staff under the Green Office project is to compare the type of organization. Gender comparison, age comparison, education level comparison, compare by job title, comparison of time worked in current position, comparison of debt level, comparison by environmental training. Comparison with environmental information showed that most of the staff. There were opinions on factors affecting the awareness of staff in environmental management under the green office project. Most of the male staff members (98.41%) had most of the staff with doctoral degree (100%). Most of the staff in the top management positions (98.70%). Most of the staff trained in the environment (98.62%) and most of the staff users never received environmental information (100 %) agreed that awareness affect environmental management under the most green office.

a study of variables explaining the involvement and awareness of staff in environmental management of green office staff in accordance with the principles of grounded theory

Participation variables of staff in environmental management. (Figure 3)

1) The organizational characteristics that influence the participation of the staff in environmental management under the green office project are clearly defined by the organizations, visions, policies, and guidelines. The role and authority of staff in environmental management are clear.

2) Management factors affect the participation of staff in environmental management under the green office project, consisting of the management's commitment to environmental management, vision and the concept of management development.

3) Factors affecting the staff characteristics of the units that affect the participation of staff in environmental management under the green office project are the staff appreciation. And the importance of environmental management.

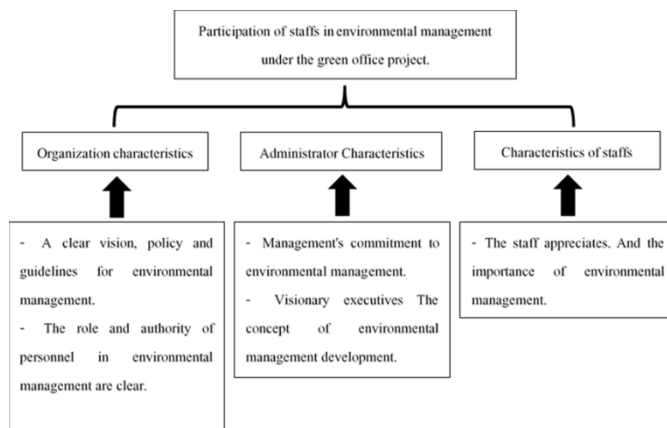
Awareness variables of staff in environmental management. (Figure 4)

1) Factors in collaborating to solve environmental problems. In order to keep the environment clean, the environmental awareness of the staff under the Green Office project.

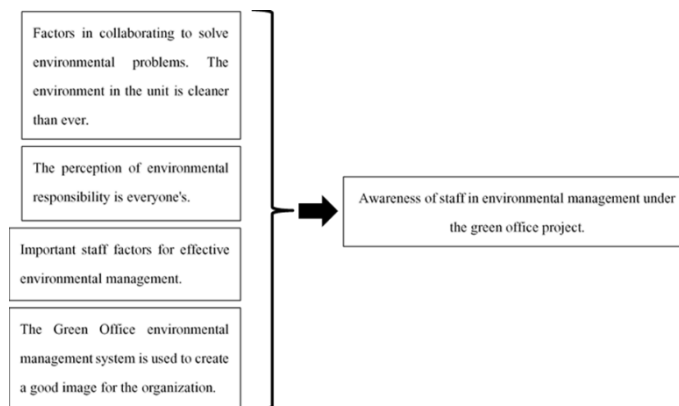
2) The perception of the role of environmental management as a result of everyone's awareness of environmental management staff under the green office project.

3) Staff factors are important for effective environmental management, resulting in awareness of environmental management staff under the Green Office project.

4) The Green Office Environmental Management System was used to create a good image for the organization, which affected the environmental awareness of the staff under the Green Office Project.



**Fig. 3** Participation variables of staff in environmental management.



**Fig. 4** Awareness variables of staff in environmental management.

## VII. DISCUSSION AND RECOMMENDATIONS

Discussing the results of this study were presented variables describing the participation and awareness of the staff on environmental management of staff within the green office of principles grounded theory.

### variables of staff participation in environmental management within the participating green office.

#### 1) The characteristics of the organization.

Factors affecting key organizational characteristics are clear visions, policies, and practices in environmental management. The role and authority of staff in environmental management are clear. This is consistent with the vision,

policy and guidelines for environmental management. Determining role and authority of environmental management staff. The government organizations. Governmental organization state enterprises and the sector is clearly operating.

#### 2) The characteristics of the administrator.

Factors affecting key management characteristics are management's commitment to environmental management. And visionary executives. The concept of environmental management development. This is consistent with the findings [11] of supervisors Affect the work of staff in the organization. And found that the support of management There was a positive relationship with the participation of staff in quality assurance in education. [12]

#### 3) The characteristics of staff.

The most influential factor affecting the characteristics of staff in the organization is the perceived value and the importance of environmental management. Comply with the research [13] is found that the management approach of public participation. To be a person or a group of people to participate in various stages. In the development of support to help in various matters. Or activities. Since joining the joint decision. Benefit And to assess the acceptance. And to maximize the benefit of all parties.

### variables of staff awareness of environmental management within the office participating in the green office.

1) Factors in collaborating to solve environmental problems. The environment in the unit is cleaner than ever. This is consistent with the research conducted by Pongchai Chalermklin (2008) [8] which found that behaviors reflect one's responsibilities. It is emotional, attitude and values affecting to people's awareness.

2) The perception of environmental responsibility is everyone's. This is the result of the research conducted by Veerachon Khawpong (2008). [14] Perception of self-consciousness is the attitudes, thoughts, beliefs, and attitudes that give rise to awareness and perception.

3) Staff factors are important for effective environmental management. This is consistent with research by Prayuth Suwansri (2013) [15], which found that the samples were important for environmental management. The samples were conducted in accordance with the high level environmental management guidelines. To be aware of high environmental management.

4) The environmental management system of green office is used to create a good image for the organization. In accordance with the research of Akekaluk Tanacharoenphisarn (2011), it was found that the implementation of environmental management system (ISO 14001) by the people who have accepted the use of environmental management system (ISO 14001) to benefit the organization. To be aware of environmental management at high level.

## RECOMMENDATIONS

1. Green Office project there should be a communication system for the exchange of standardized information between the responsible persons of each division and between organizations.

2. The organization should encourage the development of internal information systems in relation to the green office project in particular, to facilitate the storage of data as well as the organization. And use the information.

3. Research in the form of research and development. To develop a better awareness of environmental management.

#### ACKNOWLEDGEMENTS

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# Environment management system assessment ISO14001:2015 of Honda car service center

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## Abstract

The research aimed to do the following: 1) to study the environmental management of a Honda car service center. 2) To analyze the relationship between the organization's management and the attitude of personnel to the environmental. 3) To assess the effectiveness of the Environmental Management System ISO 14001: 2015 based on greenhouse gas emissions data from a Honda car service center. In order to do this CO<sub>2</sub> emissions from activities and services, garbage, and wastewater were analyzed. This was done by applying data from the Intergovernmental Panel on Climate Change (IPCC) based on Life Cycle Assessment (LCA) of services. Electricity and water utilization, garbage and waste water production was converted to CO<sub>2</sub> emissions and compared with the volume of cars being serviced. Service activities carried out in the Honda car service center included engine check and repair services (General Repair) and paint and body repair. CO<sub>2</sub> emissions per car were calculated in order to analyze the effectiveness of environment management systems. The data calculated was presented by branch and compared with personnel attitude and environmental behavior of staff in each branch.

The study found that the performance of environment management system in Honda car service centers differ widely. The results of questionnaires seeking to understand if personnel attitude and environmental behavior were the cause of this found that it was not. The conclusion is that the effectiveness of environment management systems depends on the importance of environmental management and everyone in the organization.

**Keywords :** CO<sub>2</sub> Emissions by automobile service center, Environmental behavior, ISO 14001:2015

## I. INTRODUCTION

At the present time, Thailand is a country that has developed in the automotive industry. And the cars can be considered an important factor in life. Since humans have traveled from place to place. Moreover, the continued expansion of the city. This is contrary to the public transport system that is not enough. Thus causing the stimulation of consumer demand that is driving more and more by the year 2016 the car market, with a total sales volume of 768,788 car [1] The cars are long lifetime, they are the securities that have been accepted in the market. The selling price per and can be used as collateral. Throughout the lifespan but cars that need maintenance. Check and repair Equipment and engines regularly to prolong its lifespan. Motorists will encounter various problems of car repair car because it contains quite a lot of male motorists are unable to repair themselves, resulting in most of the riders. Must be a car mechanic who has experience in the automotive technician. As a result, automotive service centers increased to meet ongoing needs. It is estimated that in the car or car repair service center, both large and small, as well as about 40,000, divided into two categories, service categories, service center. In networked automobile manufacturers such as Toyota, Honda, Nissan, Mitsubishi, etc., and independent garages. Including independent garage under the car. The car received a single brand or multi-brand integration. Honda The company has sales ranked third in the year 2016 with a sales volume of 107,342 car, representing a 14.0% market share, and in 2017 the Honda, the growth rate increased for the first time in 5 years. sales growth of 19% with a total memory car, cars totaled 127,768 car, which resulted in the year 2017, the Honda is a company with sales being # 1 and the rate of

growth was the result. company Honda service centers and showrooms in total, 232 of which are divided into showrooms full of 20 and showroom, a service center, general 227 of the center and showroom, a service center and service center Paint and body repairs. 171 auto service centers in the center, which has been used or garage equipment as well as chemicals. And technologies to be used in the service. The introduction of a tool or machine is needed to take into account the procedures and the safe use and how to prevent legitimate. Including control environment, for example, heat, light, noise, dust and chemicals and to control the problem of environmental pollution, such as sewage, waste, water pollution, air pollution. Which affect the health of the operators directly and cause environmental problems. This is consistent with the Ministry of Health matters that are harmful to health 2015. The Health Act 1992 [2] requires that activities related to motor vehicles. Mining or Engineering is one of the 13 parties that are harmful to health. Although at present there is no legal issue with any provisions regarding the environmental standards of the automotive service centers clearly have a local agency. Municipal or District Administrative Office is overseen by the dumping of waste oil into the public space. However, enforcing the law, the above is not enough to control and prevent the problem from all automotive service centers. And the impact on the environment, both male practitioners and those involved or who may be affected due to the adjoining areas. This makes a complaint, the impact on the environment and the effects on male workers followed. There are many causes of automotive service centers that improve attention and reduce environmental impact. And security within the automotive service centers is increasing. The system of environmental management.

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ISO14001: 2015 to assist in the implementation of internal management, automotive service centers to ensure efficient and minimize such effects. The issue of environmental impact and reduce the risk of industrial action causes the system standard called ISO 14001, a standard that is recognized internationally. And adhere to the standards used to confirm the potential operation of industrial plants and companies. The implementation of this system.

ISO14001 environmental management system is a system that focuses on business development with reduced environmental impact. It also reduces the cost of production in 2015 has been revised standards and new requirements. This is an improvement of three times the standard system to handle this. The expanded scope of responsibilities. And looking to add more context and a focus group with stakeholders on issues raised by looking within. And external issues together Environmental issues are also ongoing violence. The complaint statistics in environmental issues for the year 2016 [3] found that complaints by Bangkok about 688 to 253 complaints to the subject, or 36.77 percent of all complaints. About 688 complaints were found to have the odor that most complaints were about 472 to about 265, noise, dust and soot, some noise / noise about 211, respectively. The data from the standard car service centers that are being appealed as well. The researchers therefore to study the conditions of service standards. In terms of environmental issues, as well as factors that influence environmental management by the study area is the center of a Honda because of its availability in the environmental management system ISO 14001: 2015. the standard rate and high economic growth. By studying the elements of the standard auto service centers are affiliated, location type, size, revenue policy of car service center personnel. As well as personnel of the service standard car include age, education, work experience. And cognitive, environmental, and security. Using the survey data, assessment and monitoring agency. And created and applied a questionnaire survey and observation of environmental management of automotive service centers. This information will be useful to set guidelines for environmental issues. And can be used to set standards further.

## II. RESEARCH OBJECTIVE

To assess the effectiveness of the environmental management system ISO 14001: 2015 and factors that may affect the potential of the environmental management system. Organizational factors and personnel factors. Impact on environmental management in Honda cars services center.

## III. RESEARCH HYPOTHESIS

The researchers expected Factors that affect personnel management system and environmental as well as affecting the effective control of the environmental impact as well.

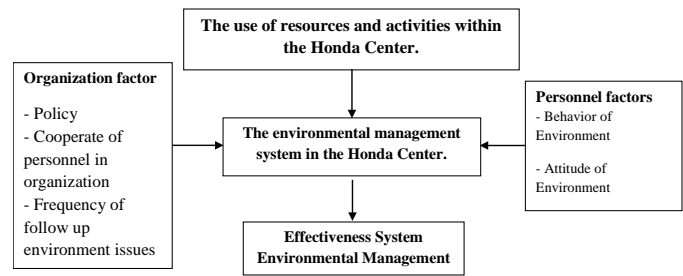


Fig. 1 Conceptual framework

## IV. RESEARCH FRAMEWORK

This research use framework of LCA(Life Cycle Assessment) by gate to gate [4] for study environment management system in Honda cars services center and comparison with organization factor and personnel factor for study the relate between effectiveness of environment management system and personnel factor like environmental attitude and environmental behavior

## V. POPULATION AND SAMPLE GROUPS

Representative samples, used in this research, were simple sampling in Service Centers by choosing 40 Service Centers from 232 Service Centers. For estimating the potential of environmental management in Honda cars service center.

## VI. RESEARCH TOOLS

Knowledge and understanding in working including with personal operational behavior questionnaire which writer created by considering textbooks and related researches to consist of following

Parts 1 Personal Characteristic questionnaire by gender, age, job position, experience the questionnaire about environmental management and cooperation in organization for estimating the potential of environmental management, environmental [5] attitudes of respondents for indicating in knowledge and environmental attitudes of operators in Honda Service Centers. Including to environmental behaviors of respondents in workplace and daily life.

Parts 2 The questionnaire about resource usage in Honda Service Centers, including to data of filth and wastes, and quantity of cars were serviced in each month between 2016 - 2017 years

## VII. RESEARCH RESULT

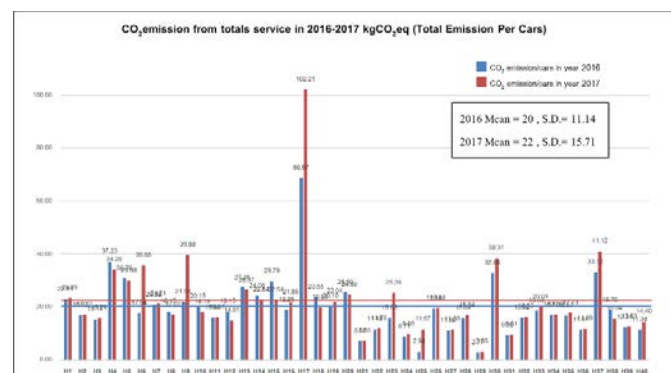


Fig. 2 CO<sub>2</sub> emission from service in honda cars service center per cars in year 2016 – 2017

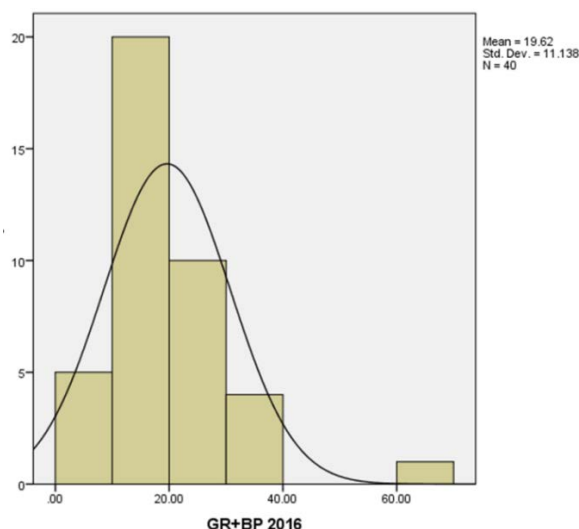


Fig. 3 Normal curve and histogram show the efficiency in honda cars service center in year 2016

From the figure 3, it was found that the normal curve had the left skewed characteristics, the average value was less than the median and values. Shows the level of environmental management efficiency.

High efficiency are less than 8.48

Medium efficiency are 8.48 to 30.76

Low efficiency are more than 30.76

TABLE I. NUMBER AND PERCENTAGE OF SERVICE CENTERS CLASSIFIED BY TYPE OF PERFORMANCE IN YEAR 2016

TYPE OF EFFICIENCY	AMOUNT	PERCENTAGE
HIGH EFFICIENCY	3	7.5
MEDIUM EFFICIENCY	32	80.0
LOW EFFICIENCY	5	12.5
<b>TOTAL</b>	<b>40</b>	<b>100</b>

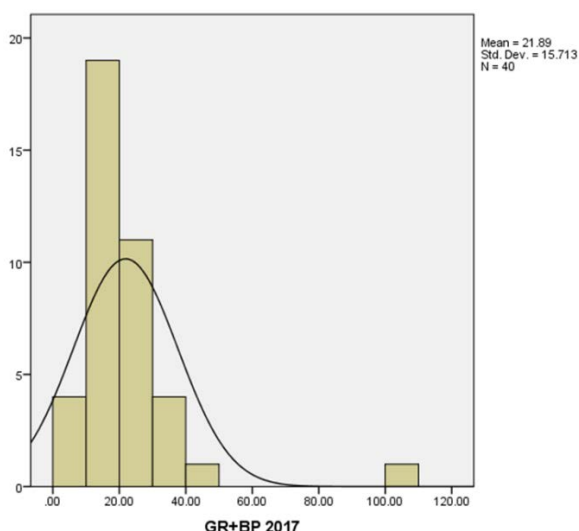


Fig. 4 Normal curve and histogram show the efficiency in honda cars service center in year 2017

From the figure 4, it is found that the normal curve has a symmetrical nature, with the mean, median and values having similar values. Shows the level of environmental management efficiency.

High efficiency are less than 6.18

Medium efficiency are 6.18 to 37.60

Low efficiency are more than 37.60

TABLE II. NUMBER AND PERCENTAGE OF SERVICE CENTERS CLASSIFIED BY TYPE OF PERFORMANCE IN YEAR 2017

TYPE OF EFFICIENCY	AMOUNT	PERCENTAGE
HIGH EFFICIENCY	1	2.5
MEDIUM EFFICIENCY	35	87.5
LOW EFFICIENCY	4	10.0
<b>TOTAL</b>	<b>40</b>	<b>100</b>

From the efficiency of Honda cars services center in year 2016 and 2017 will compare with environment management and cooperate in organization and environment behavior and attitude of personnel in organization.

TABLE III. NUMBER AND PERCENTAGE OF ENVIRONMENT BEHAVIOR OF PERSONNEL IN ORGANIZATION IN YEAR 2016

Percentage of operators who have correct behavior of using electricity.	Total Efficiency in 2016			
	High	Medium	Low	Total
Less than average	3(16.67)	10(55.56)	5(27.78)	18(100.00)
Greater than or equal average	5(22.73)	15(68.18)	2(9.09)	22(100.00)
<b>Total</b>	<b>8(20.00)</b>	<b>25(62.50)</b>	<b>7(17.50)</b>	<b>40(100.00)</b>
Percentage of operators who have correct behavior of using water supply.	Total Efficiency in 2016			
	High	Medium	Low	Total
Less than average	3(15.00)	11(55.00)	6(30.00)	20(100.00)
Greater than or equal average	5(25.00)	14(70.00)	1(5.00)	20(100.00)
<b>Total</b>	<b>8(20.00)</b>	<b>25(62.50)</b>	<b>7(17.50)</b>	<b>40(100.00)</b>
Percentage of operators who have correct behavior of management with waste or sewage.	Total Efficiency in 2016			
	High	Medium	Low	Total
Less than average	2(11.11)	12(66.67)	4(22.22)	18(100.00)
Greater than or equal average	6(27.27)	13(59.09)	3(13.64)	22(100.00)
<b>Total</b>	<b>8(20.00)</b>	<b>25(62.50)</b>	<b>7(17.50)</b>	<b>40(100.00)</b>
Percentage of operators who have correct behavior of using chemicals.	Total Efficiency in 2016			
	High	Medium	Low	Total
Less than average	4(21.05)	12(63.16)	3(15.79)	19(100.00)
Greater than or equal average	4(19.05)	13(61.90)	4(19.05)	21(100.00)
<b>Total</b>	<b>8(20.00)</b>	<b>25(62.50)</b>	<b>7(17.50)</b>	<b>40(100.00)</b>

Percentage of operators who have correct behavior of using fuels.	Total Efficiency in 2016			
	High	Medium	Low	Total
Less than average	7(31.82)	13(59.09)	2(9.09)	22(100.00)
Greater than or equal average	1(5.56)	12(66.67)	5(27.78)	18(100.00)
<b>Total</b>	<b>8(20.00)</b>	<b>25(62.50)</b>	<b>7(17.50)</b>	<b>40(100.00)</b>
Percentage of operators who have correct behavior in consumption.	Total Efficiency in 2016			
	High	Medium	Low	Total
Less than average	3(15.79)	14(73.68)	2(10.53)	19(100.00)
Greater than or equal average	5(23.81)	11(52.38)	5(23.81)	21(100.00)
<b>Total</b>	<b>8(20.00)</b>	<b>25(62.50)</b>	<b>7(17.50)</b>	<b>40(100.00)</b>
Percentage of operators who have correct behavior in other parts.	Total Efficiency in 2016			
	High	Medium	Low	Total
Less than average	4(21.05)	13(68.42)	2(10.53)	19(100.00)
Greater than or equal average	4(19.05)	12(57.14)	5(23.81)	21(100.00)
<b>Total</b>	<b>8(20.00)</b>	<b>25(62.50)</b>	<b>7(17.50)</b>	<b>40(100.00)</b>
Percentage of operators who have negative environment behavior.	Total Efficiency in 2016			
	High	Medium	Low	Total
Less than average	7(29.17)	14(58.33)	3(12.50)	24(100.00)
Greater than or equal average	1(6.25)	11(68.75)	4(25.00)	16(100.00)
<b>Total</b>	<b>8(20.00)</b>	<b>25(62.50)</b>	<b>7(17.50)</b>	<b>40(100.00)</b>

TABLE IV. NUMBER AND PERCENTAGE OF ENVIRONMENT ATTITUDE OF PERSONNEL IN ORGANIZATION IN YEAR 2016

Percentage of operators who have correct attitudes in environment.	Total Efficiency in 2016			
	High	Medium	Low	Total
Less than average	2(12.50)	12(75.00)	2(12.50)	16(100.00)
Greater than or equal average	6(25.00)	13(54.17)	5(20.83)	24(100.00)
<b>Total</b>	<b>8(20.00)</b>	<b>25(62.50)</b>	<b>7(17.50)</b>	<b>40(100.00)</b>

TABLE V. NUMBER AND PERCENTAGE OF ENVIRONMENT MANAGEMENT AND COOPERATE IN ORGANIZATION IN YEAR 2016

Percentage of operators who perceive in environment management and cooperate in organization.	Total Efficiency in 2016			
	High	Medium	Low	Total
Less than average	6(27.27)	12(54.55)	4(18.18)	22(100.00)
Greater than or equal average	2(11.11)	13(72.22)	3(16.67)	18(100.00)
<b>Total</b>	<b>8(20.00)</b>	<b>25(62.50)</b>	<b>7(17.50)</b>	<b>40(100.00)</b>

And compare in year 2017

TABLE VI. NUMBER AND PERCENTAGE OF ENVIRONMENT BEHAVIOR OF PERSONNEL IN ORGANIZATION IN YEAR 2017

Percentage of operators who have correct behavior of using electricity.	Total Efficiency in 2017			
	High	Medium	Low	Total
Less than average	3(16.67)	12(66.67)	3(16.67)	18(100.00)
Greater than or equal average	4(18.18)	15(68.18)	3(13.64)	22(100.00)
<b>Total</b>	<b>7(17.50)</b>	<b>27(67.50)</b>	<b>6(15.00)</b>	<b>40(100.00)</b>
Percentage of operators who have correct behavior of using water supply.	Total Efficiency in 2017			
	High	Medium	Low	Total
Less than average	2(10.00)	15(75.00)	3(15.00)	20(100.00)
Greater than or equal average	5(25.00)	12(60.00)	3(15.00)	20(100.00)
<b>Total</b>	<b>7(17.50)</b>	<b>27(67.50)</b>	<b>6(15.00)</b>	<b>40(100.00)</b>
Percentage of operators who have correct behavior of management with waste or sewage.	Total Efficiency in 2017			
	High	Medium	Low	Total
Less than average	2(11.11)	13(72.22)	3(16.67)	18(100.00)
Greater than or equal average	5(22.73)	14(63.64)	3(13.64)	22(100.00)
<b>Total</b>	<b>7(17.50)</b>	<b>27(67.50)</b>	<b>6(15.00)</b>	<b>40(100.00)</b>

Percentage of operators who have correct behavior of using chemicals.	Total Efficiency in 2017			
	High	Medium	Low	Total
Less than average	4(21.05)	13(68.42)	2(10.53)	19(100.00)
Greater than or equal average	3(14.29)	14(66.67)	4(19.05)	21(100.00)
<b>Total</b>	<b>7(17.50)</b>	<b>27(67.50)</b>	<b>6(15.00)</b>	<b>40(100.00)</b>
Percentage of operators who have correct behavior of using fuels.	Total Efficiency in 2017			
	High	Medium	Low	Total
Less than average	6(27.27)	14(63.64)	2(9.09)	22(100.00)
Greater than or equal average	1(5.56)	13(72.22)	4(22.22)	18(100.00)
<b>Total</b>	<b>7(17.50)</b>	<b>27(67.50)</b>	<b>6(15.00)</b>	<b>40(100.00)</b>
Percentage of operators who have correct behavior in consumption.	Total Efficiency in 2017			
	High	Medium	Low	Total
Less than average	2(10.53)	16(84.21)	1(5.26)	19(100.00)
Greater than or equal average	5(23.81)	11(52.38)	5(23.81)	21(100.00)
<b>Total</b>	<b>7(17.50)</b>	<b>27(67.50)</b>	<b>6(15.00)</b>	<b>40(100.00)</b>
Percentage of operators who have correct behavior in other parts.	Total Efficiency in 2017			
	High	Medium	Low	Total
Less than average	4(21.05)	13(68.42)	2(10.53)	19(100.00)
Greater than or equal average	3(14.29)	14(66.67)	4(19.05)	21(100.00)
<b>Total</b>	<b>7(17.50)</b>	<b>27(67.50)</b>	<b>6(15.00)</b>	<b>40(100.00)</b>
Percentage of operators who have negative environment behavior	Total Efficiency in 2017			
	High	Medium	Low	Total
Less than average	6(25.00)	16(66.67)	2(8.33)	24(100.00)
Greater than or equal average	1(6.25)	11(68.75)	4(25.00)	16(100.00)
<b>Total</b>	<b>7(17.50)</b>	<b>27(67.50)</b>	<b>6(15.00)</b>	<b>40(100.00)</b>

TABLE VII. NUMBER AND PERCENTAGE OF ENVIRONMENT ATTITUDE OF PERSONNEL IN ORGANIZATION IN YEAR 2017

Percentage of operators who have correct environment attitudes.	Total Efficiency in 2017			
	High	Medium	Low	Total
Less than average	2(12.50)	13(81.25)	1(6.25)	16(100.00)
Greater than or equal average	5(20.83)	14(58.33)	5(20.83)	24(100.00)
<b>Total</b>	<b>7(17.50)</b>	<b>27(67.50)</b>	<b>6(15.00)</b>	<b>40(100.00)</b>

TABLE VIII. NUMBER AND PERCENTAGE OF ENVIRONMENT ENVIRONMENT MANAGEMENT AND COOPERATE IN ORGANIZATION IN YEAR 2017

Percentage of operators who perceive in environmental management and cooperate in organization.	Total Efficiency in 2017			
	High	Medium	Low	Total
Less than average	5(22.73)	14(63.64)	3(13.64)	22(100.00)
Greater than or equal average	2(11.11)	13(72.22)	3(16.67)	18(100.00)
<b>Total</b>	<b>7(17.50)</b>	<b>27(67.50)</b>	<b>6(15.00)</b>	<b>40(100.00)</b>

## VIII. DISCUSSION & CONCLUSION

As a result, a percentage of the environmental management and internal cooperation of the Organization, including percentage, attitude and behavior of the personnel. No significant effect on environmental management efficiency in the engine repair and electrical system of the Honda Vehicle Service Center due to the efficiency of environmental management. The good siege is due to the management of the company who has taken importance and to take care of the environmental management within the center, as well as to minimize the impact on environmental impacts include enforcing rules [5] within an organization, such as policy, promoting, saving, using electricity or water, and using, but fit. and maintenance of various equipment regularly, it helps to ensure the efficiency of environmental management, as well as to reduce greenhouse gases from corporate activities.

## IX. RECOMMENDATION

1 Management must be committed and focused on the environment to drive environmental management systems. ISO 14001:2015

2 Management should issue a policy related to energy saving as a guide to reducing greenhouse gas values and re-check effectiveness consistently.

3 Honda Automobile (Thailand) headquarters should be monitoring performance of environment management system regularly monitored

4 Field man from Honda Automobile (Thailand) headquarters should audit the entire management in Honda cars services center. Not focusing on sales only

5 Owner or manager should be allocate budgets and resources for environmental management.

6 Environmental training should be provided to all personnel not only environmental team.

7 Honda automobile headquarters should establish an environmental communication system.

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# Land snail as alternative food: safety and nutritional perspectives of *Cyclophorus haughtoni*

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## Abstract

At the present, land snails were used for food in many countries. As same as Thailand, especially *Cyclophorus haughtoni* (Hoi Hom), indigenous species, were consumed as a popular dish such as Tom Yum Hoi Hom and Larb Hoi Hom, etc. However, nutrition and food safety information still required. This research aims to study the proximate composition, pathogenic parasite, and heavy metals accumulation of *C. haughtoni*. It represented that *C. haughtoni* contained %moisture, %ash, %crude protein, %crude fat and %carbohydrate were  $81.85\% \pm 0.30$ ,  $1.28\% \pm 0.03$ ,  $14.07 \pm 0.04$ ,  $0.38 \pm 0.01$ , and  $2.42 \pm 0.08$ , respectively. Pathogenic parasite detection by using artificial digestion technique revealed that all the samples were infected with unknown species parasite. For heavy metals analysis by using Wavelength dispersive X-ray Fluorescence technique (WD-XRF) indicated that shell and meat not accumulated with harmful heavy metals. The highest element that found in shell was oxygen (50.52%) and carbon in meat (43.49%). In conclusion, this species is appropriate to be a good alternative food because they have high protein and safe from contamination with harmful heavy metals as well as pathogenic parasite. In order that, this species have to additional study about their parasite. Biological and environmental factors are required for appropriate cultivation system development to be the commercial food in the future.

**Keyword:** *Cyclophorus haughtoni*, Alternative food, Food security

## I. INTRODUCTION

Land snails not only have important roles in ecology but also have had close relationships with human for a long time. They are used for many purposes such as jewelry, money, instruments, toys, medicines, cosmetics and especially food [1]. Land snails have been classified as protein resource and alternative food. They have been widely consumed in Europe and Africa [2]. Each year, around 40,000 tons of land snails are consumed especially in Europe where they are often considered a delicacy. Their cost ranges from 100 Baht for a general dish to 68,000 Baht per kilogram of snail caviar [3]. Many previous studies have revealed nutrition information of land snails such as African snail (Congo meat), and *Helix pomatia* (escargot or Roman snails).

In Thailand, some species of land snails are also considered as food, particularly genus *Cyclophorus*. Their price is about 200 Baht per kilogram at local market [4]. (*Cyclophorus* is an operculated land snail with a thick and large pyramid or turbinated shell. They are obliquely spotted with zigzag chestnut stripes. They have fine shell surface with a desultory dark brown or black pattern. The largest size range of this adult species range between 20-25 mm in height and 30-40 mm in width (Figure No 1), 40-150 eggs are usually laid per hatching by an adult female. The larvae take between 5-8 months to grow into an adult after hatching. They have been found in all region of Thailand except south of Thailand [5]. Their lifespan is relatively long ranging between 1-5 years [6]. They are usually found widely in area under canopy shade, which have the essential factors for their survival e.g. food,

limestone, and moisture [7]. Moreover, they are commonly used for local dish in many regions of Thailand such as Tom Yum Hoi Hom, Larb Hoi Hom, etc.

However, land snail consumption needs careful consideration about food safety, particularly diseases caused by pathogenic parasite as reported from previous studies [8] found that *Angiostrongylus cantonensis* parasites were the carrier of meningitis disease (*Eosinophilic meningoencephalitis*) There is also an issue of heavy metals that can accumulate in animal tissue [9] and it can be transferred along food chains or webs, establishing public health problems [10].

However, these previous studies have concentrated only about taxonomy, morphology, and distribution for this genus. Till date, there is no official study about nutrition, parasites, and concentration of heavy metal in this species. Therefore, this study aims to fill up the gap in knowledge by providing information to promote this species of land snail as an alternative future food in order to food security for Thailand and international countries.

## II. MATERIALS AND METHODS

### 1. Sampling site

Three hundred and eighty four individuals of adult *C. haughtoni*, having major shell height diameter between 30-40 mm were collected between rainy season (June 2018 to October 2018) from agricultural area nearby Khao Sum Bot bureau of monks, Pluang Thong sub-district, Bo-Thong district, Chonburi province, Thailand (13° 9' 18" N 101° 35' 50" E) by

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accidental random sampling method calculated as given equation (1) [11]

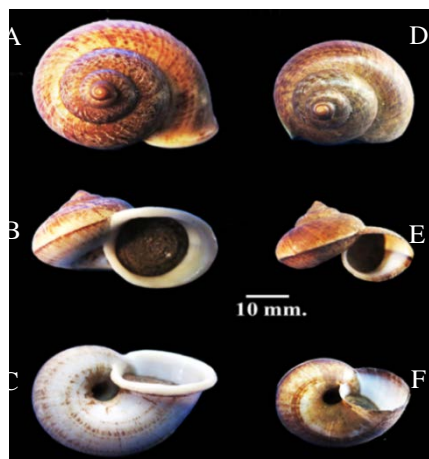


Fig.1 External characteristics of adult *C. haughtoni*, top (A) lateral (B) and anterior (C) and external characteristics of juvenile *C. haughtoni*, top (D) lateral (E) and anterior (F)

$$N = (Z_c \sigma / e_m)^2 \quad (1)$$

Where:  $N$  = Sample size  
 $Z$  =  $Z$  point as significant level that researcher determined ( $\alpha$ ) at 95% confidence or 1.96  
 $\sigma$  = Standard deviation of population  
 $e_m$  = Error acceptable. In this study determined it as 1/10 of standard deviation of population, so  $\sigma/e_m$  was 10

After collection, all of the samples were cleaned by washing in distilled water. After that, thirty *C. haughtoni* were separated to detect pathogenic parasites, while the other samples were frozen at  $-40^\circ\text{C}$  for 1 hour and then samples were preserved at  $-18^\circ\text{C}$  for nutritive values and heavy metals accumulation analysis [12].

### III. PROXIMATE ANALYSIS

Three hundred and fifty four- frozen samples were removed from their shells carefully and ground using a homogenizer. Then, they were weighed which resulted to approximately 25 g of the sample's meat in order to study %moisture content (MC), %ash, %crude protein (CP), and % crude fat or ether extract (EE) by the method of the Association of Official Analytical Chemists (AOAC method) [13]. %Carbohydrate or nitrogen free extract (NFE) was determined by subtracting the percent of crude protein, crude fat, moisture, and ash from 100%.

### IV. PATHOGENIC PARASITE DETECTION

Thirty fresh samples were cleaned using distilled water and were quickly removed from their shell. Each sample was kept inside a plastic box (10 cm x 10 cm x 5 cm) and it was labeled in number ranging from 1-30. After that, the samples were digested by pepsin and hydrochloric solution (15 g of pepsin powder and 15 ml of 37% hydrochloric were dissolved in 1,500 ml of DI water) [14]. After that, 30 ml of mixture solution were added into each 50 ml of centrifuge tube and the

sample meat was put together. Thereafter, thirty centrifuge tubes with the samples meat were put in water bath and incubated at  $37^\circ\text{C}$  for 1.30 hours (by mixing and keeping it for 10 minutes incubation). After incubation, the sediment was transferred in filtrated bowl and precipitated. After precipitation, the supernatant and residue part were discarded. Then, dechlorinated water was added into a bowl and the sediment was transferred into a plate. The sample was then observed under a light stereo microscope to find whether parasites were present and obviously identify its characteristic using light compound microscope with high magnifying power.

### V. HEAVY METALS ACCUMULATION ANALYSIS

Five grams of the sample's shells and meats were ground using a homogenizer and were compacted in to a 13 mm pellet. Each sample was contained in zip-lock bag and labeled. The samples were analyzed by Synchrotron Thailand Central Lab at Suranaree University of Technology with Wavelength dispersive X-ray Fluorescence technique (WD-XRF).

### VI. RESULTS AND DISCUSSION

The proximate analysis of *C. haughtoni* revealed that they had averages of %moisture, %ash, %crude protein (CP), %crude fat (EE), and %carbohydrate or nitrogen free extract (NFE) were  $81.85\% \pm 0.30$ ,  $1.28\% \pm 0.03$ ,  $14.07 \pm 0.04$ ,  $0.38 \pm 0.01$ , and  $2.42 \pm 0.08$  of percentage fresh matter, respectively (Table No 1). When prepared with African land snails (*Limicolaria* (LM), *Achatina fulica* (AF), *Achatina achatina* (AA), and *Archachatina marginata* (AM)) [15] and Roman land snails (*Helix pomatia* (HP)) [16] it was found that %moisture content was highest in LM (84.91%), while in CH was the second (81.85%) and least in AM (73.67%) as the following trend  $AF > CH > HP > AF > AA > AM$ . %ash indicated that AM was the most (2.56%), while CH was the fifth (1.28%) as the following  $AM > AA > HP > AF > CH > LM$ . %crude protein was highest in AM (19.53%), while CH was the fourth (14.07%) and was least in LM (5.85%) as the following  $AM > AA > HP > CH > AF > LM$ . %crude fat was highest in AM (2.44%) and least in CH (0.38%) as the following  $AM > AA > AF > LM > HP > CH$ . For %carbohydrate was highest in AF (7.25%) and least in HP (0.55%) as the following  $AF > LM > AA > CH > AM > HP$  (Figure No 2). Even though, %crude protein of CH was the fourth that compared with AM, AA, and HP. They were found to be similar to livestock such as mutton (16.90%), duck (18.60%), and chicken (20.50%). CH had the lowest %crude fat compared with other land snails that were mentioned above as well as egg, mutton, and duck [17]. This means that snails are a good alternative food for people with high protein but low fat diet requirement [18].

For pathogenic parasite detection in CH meat, it was found that all thirty samples were infected parasites. The highest number of parasites was 62 per sample and the lowest was 1 (Table No 2). From observations under light compound microscope, it was found that there were no larvae of Angiostrongylidae parasites in the samples. The parasites identified did not have features of L3 *Angiostrongylus cantonensis*'s head with expanded rod-like structure and knob-like tips (Figure No 3) [14]. Therefore, all of the parasites identified were unknown species. It was beyond the scope of this study to investigate their genetic background or composition. Generally, the third stage (L3) of *A. cantonensis*



or a rat lung worm has been known to be a cause of Meningoencephalitis (*Eosinophilic meningoencephalitis*) which were found naturally in mollusks especially in African snails and Hoi Due (*Hemphlecta distincta*) in Thailand. An infection with this parasite can occur from the consumption of raw or undercooked snail [19]. This study could not find the Angiostromylidae parasite, which is found in other species. The samples that were collected from sample site was not contaminated from fresh rat feces (harboring of first stage larvae of *A. cantonensis* [20]. After eating half-cooked or uncooked infectious land snail approximately 1-4 weeks, the hosts or consumer will have headache, feel queasy, and vomit. In some case, if the symptoms are severe, the patients will have rigid neck and back, convulsion, stagnant, unconscious, and finally pass away. Thus, eating well-cook land snail dish or destroying the parasite carrier animals such as rats and snails can prevent infection with pathogenic parasites [21].

Heavy metal accumulation in CH found that the sample's shell and meat had no contamination of heavy metal in both the shell and the meat. In the sample's shell, the highest element found was 50.52% oxygen and lowest was 0.01% niobium. While, in the sample's meat found highest element was 43.49% carbon and lowest was 0.001 niobium as shown in Table No 2. In this study no trace of toxic heavy metals were found. The presence of Arsenic (As), Cadmium (Cd), Mercury (Hg), and Lead (Pb) were investigated as The Agency for Toxic Substances and Disease Registry (ATSDR) identified these heavy metals had serious health implications [22]. Food must not have these heavy metals because if human or animals' intake contaminated food with heavy metals for a long time or obtained high quantity which exceeded the standard, it will accumulate and damage in their bodies [23]. In this study, the sample site was safe from heavy metals contamination. This is thought to be because the agricultural area near the sample site was an organic farm and quite far from urban areas. This sample site was therefore suitable for collecting the sample land snails.

TABLE. I PROXIMATE COMPOSITION OF *C. HUAGHTONI* MEAT (G/100 G OF FRESH MATTER)

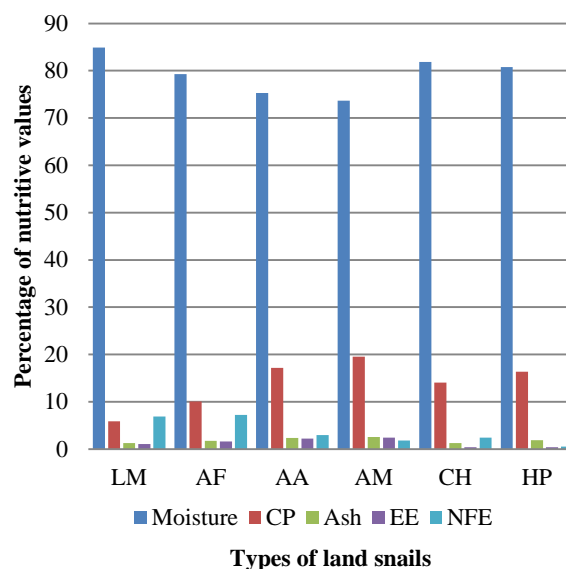
Nutrients (%)	Mean	S.D.
Moisture content (MC)	81.85	0.30
Ash	1.28	0.03
Crude protein (CP)	14.07	0.04
Crude fat (EE)	0.38	0.01
Carbohydrate (NFE)	2.42	0.08

## Conclusion

Our findings show that *Cyclophorus haughtoni* have nutritive values for human food. By proximate method, CH has crude protein as much as AM, AA, and HP but lower carbohydrate and lowest fat when compared with African land snails and Roman land snail. Moreover, the flesh able to supply protein as well as mutton, duck, and chicken meat. There was no detection of the Angiostromylidae parasite which causes Meningoencephalitis (*Eosinophilic meningoencephalitis*).

This confirmed that CH security may not the pathogenic carrier. Nonetheless, another species of parasite which could not be identified was found in all of samples (n=30). For this reason, cooking the flesh thoroughly is recommend for the consumer. There was no detection of harmful heavy metals in both in the shell and meat samples

Comparison of proximate analysis in six types of land snails



*Limicolaria* (LM), *Achatina fulica* (AF), *Achatina achatina* (AA), *Archachatina marginata* (AM), *Cyclophorus huaghtoni* (CH), and *Helix pomatia* (HP)

Fig. 2 Comparison of proximate analysis in six types of land snails (percentage of fresh matter)

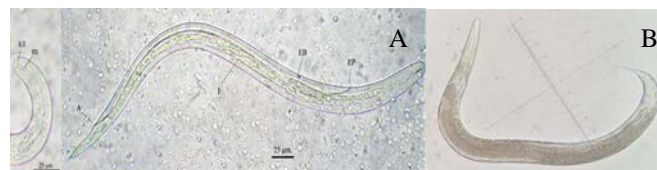


Fig. 3 Comparison of anatomy features between L3 stage of *A. cantonensis* with expanded rod-like structure (RS), and knob-like tips (KT), excretory pore (EP), esophagus bulb (EB), intestine (I), and anus (A) [14], and unknown species that found in this study.

In summary, CH should be considered as a good alternative food source. This species could be a good protein source that is commonly found in areas. It could be utilized as sustainable food if it is managed well. In addition, a more indepth study about their parasites should be carried out. Biological and environmental factors that influence to the productivity of snails should be used so that the appropriate cultivation system can be development so that snails can be a commercial food in Thailand in the future.



TABLE. II PERCENTAGE OF ELEMENTS IN *C. HAUGHTON'S* SHELL AND MEAT BY USING X-RAY FLUORESCENCE ANALYSIS

Elements	%Mass	
	Meat	Shell
C	43.494	14.7328
N	19.3224	-
O	32.2691	50.5189
Na	0.1962	-
Mg	0.2359	0.0286
Al	0.1101	0.1073
Si	0.2274	0.2097
P	0.6514	0.0214
S	0.6746	0.0497
Cl	0.3021	-
K	0.6412	0.0637
Ca	1.7725	34.1485
Fe	0.0597	0.0547
Cu	0.0067	-
Zn	0.0248	-
Br	0.0023	-
Sr	0.0079	0.0515
Nb	0.0018	0.0133

- Means not found that element

### ACKNOWLEDGMENT

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# **Session of Hospitality and Tourism Management**

# Potential ways creative health tourism activities in the Pathom Asoke community, Nakhon Pathom province

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## Abstract

The objectives of this project were to: 1) study health tourism in Pathom Asoke community, Nakhon Pathom province; and 2) to study the potential for improving creative health tourism activities in the same community. The study sample consisted of 20 people. This included government officials in the community, merchants in the community and others lived in the community. The project instruments were a literature reviews with the key stakeholders.

The findings of the study were as follows:

1) The population in this area was found to have a good understanding in their area. It was found that there was good potential for promoting the Pathom Asoke community as a health tourism destination. The community already has suitable accommodation, facilities, attractions for nature tourism and a good built environment. Despite this improvements were found to still be required in order to improve creative health tourism activities. Existing activities were found to not be sufficiently attractive to potential tourists. Activities that were already popular encourage physical and mental improvement and include Religious Training and other activities.

2) There is potential for finding guidelines to improve the creative health tourism activities in the Pathom Asoke community. Boonniyom community has already initiated such projects and emphasized a common interest in the way activities can be carried out in the community. This was that the tourists should have the knowledge and understanding of what facilities were available in the community before traveling.

**Keyword:** health tourism, creative health tourism activities, the potentiality of health tourism

## I. INTRODUCTION

The Thai Tourism Industry is significant to the national economy and to Thai society; It generates, income, develops infrastructure, generates prosperity, provides employment, revives the economy, transportation. Those are significant to develop the basic structure system, and develops transportation, commerce and investment that make the economy rehabilitate increasingly. Today, tourism types are widely developed to be appropriate and meet the tourists' demand. Office of the National Economics and Social Development Council, [1.]

Nowadays, Health Tourism is going to be popular because Thailand comes to the elder age. The tourists in other countries fall back to attend their health more than before; for instance, Japan has opinions that Thailand as destination of health tourism. Both public sector and private sector then encourage the health tourism continuously. Especially, in the year 2018, it's the year of "Thainess Tourism and Be Permanently Trendy". The medical and health tourism is allotted one of seven main activities supported. And to aim at traveling in main cities and minor cities which Nakhon Pathom is one of the significant traveling provinces. Siamturakij, 2013 [2.]

Nakhon Pathom is in the zone of main traveling provinces. There's the advantage in term of location. It's comfortable to visit because it isn't far from Bangkok. Therefore, it's an interesting choice for the tourists or workers in Bangkok, they can avoid the stresses from work to take a rest and there are various tourist attractions; for

example, historical, cultural, agricultural, religious, and health tourisms. In Nakhon Pathom province, there are different health tourisms which Pathom Asoke community is an interesting health tourism. Office of Nakhon Pathom, [7.]

Pathom Asoke community, Nakhon Pathom province is the interesting community to support the health tourism because this area is surrounded by the nature. There is no the air pollution. That is the reason why the population in the crowd are good for health. This community is also the herbal research and development center where there's really a good management in the community. They live here unambitiously and economically. They are moral because they hold to Boonniyom's principle where is rare to find the community like this in the present. As Pathom Asoke community is devoid to improve about the creative health tourism activities. The significant thing attracts the tourists' interest to visit this community. From the interview, the people here made us know that there are a few traveling activities; for example, herbal shampoo demonstration, herbal demonstration, rice growing, vegetable planting, salted soya bean demonstration, and etc. Community of Boonniyom Pathom Asoke, 2017 [3.]

According to the following statement, the team of researchers are interested in the potentiality of being health tourism in Pathom Asoke community, Nakhon Pathom province to find the ways that make this community have the interesting and attractive activities what they could attract the tourists to visit and support this attraction to be famous in the future. That also makes the income to the people here

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increasingly. From all reason, we make a decision to do this research to find the ways for improving creative health tourism activities in Pathom Asoke community, Nakhon Pathom province.

## II. OBJECTIVES

1. to study area context to be health tourism in Pathom Asoke community, Nakhon Pathom province.
2. to study potentiality to find the guidelines for improving creative health tourism activities in Pathom Asoke community, Nakhon Pathom province.

## III. RELATED LITERATURE

The factors of tourism; 5 principal factors, called '5As' tourism factors', are:

1. Accessibility: the tourists' facilities to take them to destination or tourist attractions; for instance, transportation system, and airline. Moreover, there are also the transport industrial services; including with land, air, and seaborne transports.

2. Accommodation: the place to support the tourists who want to roost such as hotel, resort, homestay, etc. There are facilities, cost, and services in different levels; for example, restaurant, swimming pool, fitness, sauna, and business center, and facilities.

3. Amenities: the fundamental services are essential to tourism and public assistance system which are in each of attractions. If some attractions have no facilities completely, they are considered about expediency and length to visit and just rest in the nearby community.

4. Activities: to set the activities that the tourists are able to do in the rest time and travel encourages the tourists' interest and the rest time. And each activity should be various and fall on tourists' demand.

5. Attraction: It is the thing charms in natural or surrounding environments. It's the reason why the tourists come to visit; for example, amusement park, meeting, cultural charming, and community relation. Wephawee Intrakhom, [4.]

Health tourism styles: *they can be distinguished into 2 kinds that follow the objectives as follows;*

- 1) Health tourism is to travel that are divided the time from traveling and doing activities to promote health properly. The main purpose is to promote physical health and mental health as better.

- 2) Health healing tourism is to travel that are divided the time from traveling and doing activities to heal the health properly. The main purpose is to treat physical health and mental health as better

The core of creative tourism means the reality and original that the tourists will learn within the tourism area through the participating experience. And lead to understanding and appreciation in the area. To learn new things and increase the potentialities; for example, 1) to exchange knowledge between local people and tourists 2) to gain the direct experiences through participation 3) to understand and appreciate spirit 4) to learn new things to increase the potential never-ending. Sirikanya Ritpaek, [5.]

The properties of creative health tourism Narikoteepak Sangsanit, [6.] Director and Secretary of the Organization for the Development of Special Areas for Sustainable Tourism (DASTA), sets The properties of creative health tourism as follows: 1) Relationship between the owners and tourists 2) Cross-culture exchanges 3) Understanding the area 4) Experiences from participation 5) Exchanging information and circulating experiences 6) Emphasizing on participation more than the audience 7) Visitors have the opportunity to develop their potential and participate in making decision. 8) There are realities in the processes. 9) There is impression and 10) There is a particular Identity.

## IV. RESEARCH METHODOLOGY

This research is a qualitative research to study the area context and the potentiality of being health tourism in Pathom Asoke community, Nakhon Pathom province. The tools used to collect data Is an in-depth interview and observation. The target group consists of Government officials, merchant, and local people a total of 20 people. The researchers have the methodologies of the study through papers and in-depth interview as follows;

1. Study the related papers, conceptions, theories, and researches related with secondary data from variety of sources. Collect papers, select papers, and analyze papers to be the ways for constructing the interview form;

2. Take the interview from the 1st step to interview in-depth interview with people who are related with health tourism in Pathom Asoke community, Nakhon Pathom Province; including with, three government officials, four merchants and thirteen people who live in the community. The totally is 20 people through statements are synthesized from research papers were the data of Pathom Asoke community area context in the terms of background, resources, tourism resources, potential tourism, health tourism within community, and the ways to improve the creative health tourism activities; and

3. Take the data to be examined the justness by triangulation examination. The obtained data are analyzed to distinguish to follow the objectives, summarized, interpreted, and synthesized for finding the overall image under research methodology and research objectives. And the result from the study is shown by the descriptive.

## V. RESULTS

1. Data of area context in Pathom Asoke community, Nakhon Pathom province

From the interview, Pathom Asoke community is located in Phra Prathon sub-district, Mueng district, Nakhon Pathom province. This community was established from belief that was well known in the name of "faithful community or Boonniyom community. At the first time, it was set Buddhist place up. Then, people settled down their houses and school in the later days. The population in Pathom Asoke community leaned on each other among houses, temple, and school called "Bavorn" where Pathom Asoke priests gathered in a group until people are faithful in "Phor Than Samana Phothirak" who is the Sangha president of Pathom Asoke. Therefore, the Buddhist place was constructed in Pathom Asoke community. The environments within the community were adjusted; for

example, planting trees makes here shadiness and reduce the pollutions, people in this community respect five precepts, eight precepts, and ten precepts through Boonniyom principles; including with, to do for the public, to live simply, to save, to eat vegetarian food. Moreover, Pathom Asoke community is also the herbal research and development center where there's really a good management in the community. It's the reason why people in this community are able to be independent. The significant identities of Pathom Asoke community are herbal knowledge because in the community no one eats meat. They favor to plant vegetables. Therefore, there are many studies and knowledge about herbs. The tourism management in this community has the participations in the society. They will vividly have a meeting to device the duties on each person vividly for tourism work in community. The natural resources in the community are consisted of home-grown vegetables, herbs, water flowing through Phraya Phan canal, many trees in community that people helped each other to plant. In addition, the surrounding environments; for example, waterfall, amusement park, buildings, pavilions, parsonages, Summasigkha School, multi-purpose building, cafeteria, library, and many constructions. Tourism resources are consisted of garden, waterfall, shampoo plant, stone square, and unleaded agricultural garden.

## 2. Data of the Potential of Tourist Attraction in Pathom Asoke Community Nakhon Pathom

Accessibility to Pathom Asoke community, Nakhon Pathom Province has a variety of routes. Buses go through or can ride a motorcycle. There a clear direction sign. The routes can be easily to approach and well distance.

Accommodation within the community is sufficient for the tourists' needs. It can accommodate tourists and it is clean and safe because of the care provided. There are facilities based on key factors.

Facilities: In the community there are enough bathrooms to meet the needs of many tourists. it is clean and safe because there is a division of care. There are always guard around the clock. There are food and beverage services for tourists. There is enough parking for the tourists' needs and guarded throughout the day.

Tourism Activities: In the community there are demonstration activities to make herbal shampoo. To do organic farming, the Dharma training, salted soya beans demonstration, herbal demonstration. Tourism activities within the community are consistent with the living of people in the community. The duration of activities is appropriate to the tourists' needs.

Tourist attractions: the environment within Pathom Asoke community is shady and habitable every day except Monday. People in the community have good fortune which is important to attract tourists.

## 3. Data of health tourism within the community

The health tourism Activities: there are vegetarian activities, how to make herbal medicine, exercise, soaking hands and feet in the herbal water, perfuming the herbs, and etc. The most popular activity is religious training which is the health tourism activity that is good for health and maintain health. The activities in the community are not too different from the others, but there is the treat practically. The receipt

that people in the community gain, is the happiness from doing the activities to help others. The receipt that the tourists gain, is pleasure from doing the activities and the receipt that the community gain, is well known as good community.

## 4. Data of creative health tourism activities within the community

From the interviews, suggestions were made to find out how to develop creative health tourism activities. The activities were exchanged between people in the community and tourists. It is also a lack of experience in the field of visitor activity rather than activities. Tourists have an understanding of Pathom Asoke community. In addition, there is a lack of capacity building in the decision-making process. The suggestions of the people in the community are to organize activities in line with the identity of Pathom Asoke community that is Boonniyom community to do for the public. And there are suggestions that should give the visitors to come in the community. Study the previous information about Pathom Asoke community to understand the community context and not to break the rules within the community that is suggested that the way to create an impression of community activities is to have a better understanding about Pathom Asoke Community

## VI. DISCUSSIONS

For the area context, Pathom Asoke community is one of the most attractive communities in the world to support the wellness tourism. There is no air pollution. As a result, people in the community have good health. It is also the herbal research and development center where has a quality and good hygiene condition. They can set the community management up as well and be independent. People in the community live in simply lives, based on Boonniyom principles that are to do for public which is consistent with Moral Promotion Center, [8.] stated that Pathom Asoke community is very interesting to promote a healthy tourism community. However, due to the lack of developing creative health tourism activities. This is important to attract the tourists' interest to visit this community. To interview people in the community made we know that there are not many tourist activities in the community such as herbal shampoo demonstration, herbal demonstration, etc. The popular activity is religious training as a health promotion activity in the field of mind. According to the concept of Sirikanya Ritpaek [5.], she said that the health tourism promotion is a journey that promotes good physical and mental.

From the interview, to find ways to develop creative health tourism activities. In Pathom Asoke Community Nakhon Pathom It was found that creative health tourism activities. It is an important element in the decision to come to the tourist. According to Wephawee Intrakhom [4.], the factors of tourism consisted of 5 main factors or tourism factors. 5As are Accessibility, Accommodation services, Amenities, Activities, and Attraction. The characteristics of creative tourism activities of DASTA founded that creative health tourism must have a diverse, culturally or spatially diverse nature. Experienced visitors will be engaged in activities with the owner of the area which consistent with Designated Areas for Sustainable Tourism Administration, DASTA mentioned 10 properties of creative tourism as

followed; 1) Tourists and homeowners have a good relationship to each other. 2) Cross-cultural exchanges. Culture 3) depth-understanding of the tourism area culture 4) experience of participation 5) Exchanging information and circulating experiences 6) Emphasizing on participation more than the audience 7) Visitors have the opportunity to develop their potential and participate in making decision. 8) There are realities in the processes. 9) There is impression and 10) There is a particular Identity.

From the synthesis, Pathom Asoke community has to be ready to manage the activities because the creative health tourism activities are significant to attract the tourists who really love looking after their health that is in accord with Chusit Chuchat [9.] and Saranya Worakunwit [10.] stated that to set the tourism activities is necessary to plan appropriately. To focus on the physical aspects of the area that are ready to conduct tourism activities in the area in terms of readiness of stuff, cooperation in community, economy, environment, and the effects to society. Therefore, from the study and interview, and the ways to improve the creative health tourism activities in Pathom Asoke community shown that they should give precedence to the identity and unique of Pathom Asoke community about designing the health tourism activities creatively and interestingly to meet the owners and tourists' demand. It's emphasized on realities and original that tourists can learn, gain from the participating experiences, take them to comprehend, and admire the area. The tourists learn new things to increase their potential as the creative tourism activities' qualification. Those are emphasized on relationship between the owners and tourists, exchanged information and circulating experiences, impressed and understood in the area. Creative health tourism activities must be unique and particular that can be done by providing visitors with real experiences from participating in activities rather than watching demonstrations from people in the community. These activities should also be improved about the safety of tourists during doing activities and the facilities according to the theory of properties of creative tourism activities of Designated Areas for Sustainable Tourism Administration, DASTA.

## VII. SUGGESTIONS

1. Suggestions for taking this research to use as follows;

1.1 From the result, the people in Pathom Asoke community have their living that is unique and well environmental. They first focus on maintain their health. Therefore, here gets approval from the tourists who cares their health. Pathom Asoke community should develop the potentiality of being tourist attraction by using 5As tourism factors.

1.2 From the result, mostly tourists come to travel in this area who love looking after their health. They mostly want to come here to do the activities that can treat their health so, Pathom Asoke community should improve the health tourism activities more creatively to meet the tourists' demand.

2. Suggestions for next research as follows;

For the next study, it should have the study of health tourism promotion in Pathom Asoke community to make this community famed more and more.

## VIII. CONCLUSION

From the study, the team of researchers presented the results as follows; the important problem of Pathom Asoke community is the lack of the ways to develop the health tourism activities creatively. The way to develop the activities should be emphasized on Pathom Asoke community's identities. To design the health tourism activities creatively and interestingly that are matched with the area context and tourists' demanding. We should concern about the reality and primitiveness that the tourists are able to learn and gain experiences from participation with people in the community. That brings them to understand and admire this area. The tourists learn the new thing to increase their potentiality as the creative health tourism activities' properties. And we should concern with the relations between the local people and tourists that they exchange their learning to each other through participating experiences. To emphasize on the participation gets them impressions and understanding in the area. And the creative health tourism activities had better have the particular characters.

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# The development of Chiang Khan community identity for promoting tourism

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## Abstract

This study had two key aims. These were; 1) to explore the tourist's impression and opinion of the Chiang Khan Identity and 2) to identify the factors or components when using the Chiang Khan Community Identity to promote tourism. Closed-end questionnaires were distributed to 400 tourists. A total of 25 key informants in the community participated in a focused group. These groups provided both quantitative and qualitative data to achieve the aims of the research. They also helped to improve the products and services offered in the community. They provided suggestions to develop the community's tourism resources in order to improve the efficiency of the products and services provided by Chiang Khan Community. The result from the survey identified ten priority factors that should be preserved and developed with care. These were; (1) the typical wooden house architecture, (2) the hospitality of the people, (3) the language, (4) offering of sticky rice to the monks, (5) the cotton blankets, (6) the tourist walk way, (7) sweet & dry coconuts, (8) practice of paying homage to Buddha Images in nine local temples, (9) the area of Khao Pun Nam Chaeo, and (10) the boat tour along Mekhong river. The community agreed that the tourists were mostly impressed with those ten factors. As a result of the research they became more determined to preserve the identity of the community that "as we are" or "I am what I am" to encourage tourists to visit them. The recommendations pointed out that at the planning formulation level and at the practical level the members of the community should have active participation. It's also discovered that some aspects of products and services should be further studied for their impact on environment to ensure proper guidance in the community towards sustainable development.

**Keyword:** Chiang Khan, Identity, Promoting, Tourism

## I. INTRODUCTION

### A. Rationale for the study

Chiang Khan is one of the district of Loei Province located on the bank of Mekhong River on the other bank is Laos PDR. Historically Chiang Khan is connected with the Laos PDR from the past on the people (ethnic), traditions, art and culture, language, food, music, costumes and even the way of life. This part of the country has rich tourism resources such as beautiful mountains and landscapes, many famous Wats (temples), many tourist attractions and festivals, as well as good climate in the winter season that is best for the local tourism. [3]. Wantakan Seemarorit and Suwicha Sithan [7] studied Chiang Khan to find out the identity of Chiang Khan and the results indicated that its identities were associated with 8 components: 1) the wooden houses that was built in - line and made by the wood without nails. 2) A tradition of offering sticky rice to the monks in the morning while they were walking barefoot to receive the offering. 3) Chiang Khan Typical Ancient Massage that has been inherited from the old days. 4) Authentic Cotton Blanket of Chiang Khan that was the authentic heritage of Chiang Khan People. 5) Language of Chiang Khan People that was similar to Luang Prabang People in the Laos PDR. 6) Papaya Salad or SomTam (or "Dong Daeng" in Chiang Khan Language) was invented by Chiang Kham people. 7) Khao Pun Nam Chaeo or Rice Noodle with special soup, an ancient recipe was brought from the Laos PDR. 8) There is a fascinating tourist walkway at the middle of the community along the bank of Mekhong River. There is need to find the ways to develop these Identities of Chiang Khan to promote the local tourism in the area. Worachai Rotchanaphornthip [5] studied on the relationship of the local Identity and tourism in Samphanthawong district, Metropolitan Bangkok. But above

all, Wanwisa Unkhachon [8] reminded us on the declination of the Identity in the area in the study of the Identity of Song Ethnic in the Eastern Part of Thailand: A Case study of Song Ethnic Group at KhlongPhlu village, Khitchakut District, Chanthaburi Province. So the way we apply the Identity in the area for tourism should be carefully studied.

As mentioned above, this research aims to explore 1) the tourist's impression and satisfaction on Chiang Khan Identity and 2) the factors affecting Chiang Khan Community Identity to promote tourism following the national agenda of participation of the community. Moreover, it may lead to proper understanding. At the same time, it can be the stereotype of community's development in all dimensions including economic, social and environment with the goal of sustainable community in the future.

### B. Objective of the study

The aims of this study were 1) to explore the tourist's impression and satisfaction Chiang Khan Identity; and 2) to identify the factors affecting the Chiang Khan Community Identity to promote tourism.

### C. Scope of the study

The Identity is what someone or something "is". It means the characteristics, feelings, or beliefs that distinguish the individuals from others; such as the examples of "a sense of group identity or national identity" or "the identity of the company" [3]. In addition, the concept of identity has been also applied in the areas of sustainable tourism development associated with different issues including [9]:

1. preserving and conserving tourism resources (natural, historical, cultural resources) for continuous use in the future;
2. Good planning and effective management that cause none of serious environmental or socio-cultural problems in the area;

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3. Maintaining the environmental quality in the area and improving it as needed (as necessary);

4. retaining the tourist's high satisfaction and keeping the local tourism destination's popularity and marketability

5. spreading the benefits of tourism widely throughout the society

Identity is smaller unit of the sociological studies that connects to an attitude on "one's self" or character that are typically related by their roles and behaviors following a person's role. However, the identity-related theorists argued that "self" was the combination of identities based on a person's characteristics. This is similar to that a person asking himself "Who am I?" and he knows that the answer is "I am a doctor", I am a policeman, etc. Then, these answers are to be connected to the role and responsibility of that person [10].

"Identity" is classified into 5 types as follows [11].

1. Individual Identity 2. Collective Identity 3. Corporate Identity 4. Social Identity 5. Cultural Identity

Stryker and Burke proposed [11] that the creation of identity is a life-long process and men can change their characteristics so he preferred using "identity" rather than "personality". They also believed more in the freedom of choice of the individual person and they must be responsible for the choices they made for their lives and identities. Actually, these components of each individual can be combined to create one identity but it would become Identity Crisis if this process failed. In this crisis a person fails to find his true self, lacks self-esteem, and does not know how to behave properly when starting relationship with others [12].

This study was also conducted to survey the opinion of the tourists who travelled to Chiang Khan on the factors of Chiang Khan Identity. And it was also to evaluate those factors that the tourists were impressed with the most that could be enhanced or processed toward the concept of

## II. METHODOLOGY

The mixed method of the study was used. The Quantitative research survey questionnaires were distributed to a total of 400 Chiang Khan Tourists. The questionnaire was developed and tested by the IOC technique that each item asked was over the criteria of 0.5 [6]. The level of confidence was 95.44%. The reliability test result was  $r = 0.86$ . The quantitative data was analyzed by descriptive statistics of percentage, mean and standard deviation.

The Qualitative research used focused group discussion with a total of 25 key informants. This qualitative method sought to identify various issues concerning with what and how the Chiang Khan Identity should be applied for promoting the local tourism. This qualitative data was analyzed by using content analysis technique provide in-depth information for various issues concerning with what and how the Chiang Khan Identity.

### III. The conceptual framework of the study

This research was conducted to develop the sustainable approach for the Chiang Kham Identity in Loei Province. The research methodology was consisted of the following phases as follows: and how the Chiang Khan Identity.

Phase 1: The questionnaires were distributed to the domestic tourists who visited and stayed at least one night in Chiang Khan during December 2015 to February 2016. This survey sought to identify their opinions toward the identities of Chiang Khan that should be promoted in tourism development plan (Figure 1 Quantitative research design).

Phase 2: Focused group discussion was used to establish the guideline for building the community network, their participations and to look for the approach to promote tourism in Chiang Khan.

This phrase also sought their guidance for the advertising media for the Chiang Khan's tourism promotion and to construct the community corporation guideline for the tourism management. Finally, the focus group discussion explored issues associated with 'Chiang Khan Identity' underlining the results provided by the tourists in Phase 1 for further tourism management (Figure 2 Qualitative Research Design).

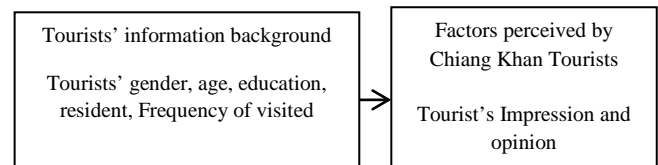


Fig. 1. Quantitative Research Design

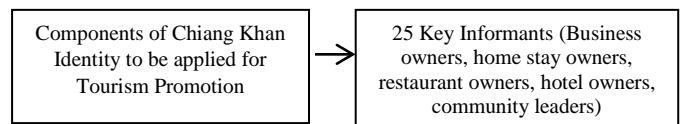


Fig. 2. Qualitative Research Design

## IV. CONCLUSION AND DISCUSSION

### A. The Quantitative Results

Most of the respondents were female in their twenties (21-30 years) and their education was secondary level. They were also from the central part of Thailand and about half of them were re-visiting tourists.

From Table I shows that most of the tourists were much and most impressed at the 10 identities of Chiang Khan such as typical wood-made houses, and others as in the Table I above.

In conclusion, the questionnaires results indicated that the tourists were satisfied with the 10 identities of Chiang Khan as listed below.

- (1) Typical homes, made of wood,
- (2) Hospitality of the people,
- (3) Local language,
- (4) Practice of offering the sticky rice to the monks,
- (5) Cotton blanket,
- (6) Tourist walkway
- (7) Sweet & dry coconut,
- (8) Practice of paying homage to Buddha Images
- (9) Khao Pun Nam Chaeo, and
- (10) Boat tour along Mekhong River

TABLE I PERCENTAGE OF TOURIST'S IMPRESSION TOWARD EACH FACTOR OF CHIANG KHAN IDENTITY

Identity	Levels of Tourist impression				
	Least	Less	Medium	Much	Most
Typical homes, made of wood	2.75	2.75	11.25	31.75	51.50
Hospitality of the local people	1.25	4.00	15.75	32.75	46.25
Local Language	0.75	4.75	16.75	33.25	44.50
Practice of offering sticky rice to Monks	2.00	5.00	12.50	36.25	44.25
Cotton Blanket	1.50	6.00	18.25	32.75	41.40
Khao Pun Nam Chaeo	3.50	6.25	19.50	30.50	40.25
Tourist walk way	1.00	4.25	16.00	39.25	39.50
Sweet & Dry Coconut	2.75	4.75	20.50	32.50	39.50
Practice of paying homage to Buddha Images	2.50	5.50	16.50	40.50	35.00
Boat tour along Mekhong River	5.00	9.75	23.75	26.50	35.00

TABLE II MEAN ( $\bar{X}$ ) AND STANDARD DEVIATION (SD) OF THE TOURIST'S SATISFACTION ON EACH FACTOR OF CHIANG KHAN IDENTITY

Identity	Level of Satisfaction		
	( $\bar{X}$ )	SD	Meaning
Typical homes, made of wood	4.27	0.96	Very high
Hospitality of the people	4.19	0.93	High
Local language	4.16	0.92	High
Practice of offering sticky rice to Monks	4.16	0.96	High
Cotton Blanket	4.07	0.99	high
Tourist walk way	4.12	0.90	High
Sweet & Dry Coconut	4.01	1.02	High
Practice of paying homage to Buddha Images	4.00	0.98	High
Khao Pun Nam Chaeo	3.98	1.08	High
Boat tour along Mekhong River	3.77	1.17	High

Table II indicates that the tourists were highly satisfied with 9 identities of Chiang Khan (the ranges were between 4.20 – 5.00 very high, 3.40 – 4.19 high, 2.60 – 3.39 medium, 1.80 – 2.59 low, 1.00 – 1.79 very low). Satisfaction level for typical wood-made houses was found to be very high.

#### B. The Qualitative Results

The focus group discussion revealed that most of the key informants agreed that the tourists were mostly satisfied with each factor of the 10 identities of Chiang Khan. Thus, these factors should be used to promote local tourism in Chiang Khan Community with cooperation of the local community members. Specifically, they focused on preserving the community's identity that "as we are" or "I am what I am" so the tourists would go and see it/them; again and again if the people in the community always welcome and serve them well. Above all, the tourism resources must be conserved for the new generation as well and a high level of tourist satisfaction must be maintained so that the local tourism destination will remain popular and marketable. Last but not least, they also hoped to earn the income as World Tourism Organization [9] defined, that it should be spread and distributed throughout the community. The corporation can be

developed by using Cohen and Uphoff [1] framework suggested that good planning should have on planning / decision-making, doing (practicing), receiving the benefits, and evaluating the projects (on cost and benefit).

#### C. Discussion

According to the qualitative and quantitative findings the local people needed the marketing management for their local identity as a product and the example of T-shirt of "Come to Loei (passed by)" (as the meaning of Loei is "passed by") as a brand management as Marshall and Johnston [2] confirmed. It means that they needed to develop the tourist products such as their wooden houses, tourist walkway in the middle of the community. They also need to promote the practice of cleaning up the Wats (temples) for tourists to go and paying homage to the Buddha (Buddha Images), and planning the sight-seeing route for boat touring along the Mekhong River.

Furthermore, the people in the Chiang Khan community need to know the way to enhance their services in the area as the local tourism products that represent various benefits and could satisfy the customer's need and demand [2]. This can be done by giving the tourists with a warm welcome and good hospitality, using local beautiful language, preserving the ritual of daily offering of the sticky rice to the monks in the morning. Additionally improving the quality of the cotton blanket, sweet & dry coconut and Khao Pun Nam Chaeo and link it with the nearby tourist attractions for joint marketing in the future could have positive outcome.

This research found that the tourists were impressed and very satisfied with every factor or component of the 10 (ten) Identities of Chiang Khan. They are: 1) Typical homes, made of wood, 2) Hospitality of the people, 3) Local language, 4) Practice of offering of sticky rice to the monks, 5) Cotton blanket, 6) Tourist walkway, 7) Sweet & dry coconut, 8)

Practice of paying homage to Buddha Images in 9 Wats (Temples), 9) Khao Pun Nam Chaeo, and 10) Boat tour along Mekhong river.

Additionally, most of the key informants agreed that as the tourists were mostly satisfied with each factor or component of 10 (ten) identities of Chiang Khan they should be applied to promote local tourism in Chiang Khan Community with the cooperation of the local people. Moreover, they also focused on preserving the community's identity that "as we are" or "I am what I am" so the tourists will go to see it/them; again and again if the people in the community always welcome and serve them well.

## V. RECOMMENDATION OF THE STUDY

### A. Recommendation on Policy formulation

1. Loei Provincial Authority should add Chiang Khan District tourism into the Provincial Tourism Plan and link all attractions in the province as the net-working to share the tourist to one another.

2. Chiang Khan Local Authority should set up the tourism plan under the supervision of the province and with the cooperation of local people to preserve and conserve their local tourism resources, as well as enhance the sustainable development and marketing by connecting themselves to the nearby communities.

### B. Recommendation for Future Research

1. The 10 factors of Chiang Khan Identity that tourists were mostly impressed with should be preserved and developed carefully for the sustainable growth of the local tourism as other factors should be studied for further development in the future.

2. The people in the community (especially the village leaders) should form a special team to support the authority on formulating the tourism plan and the way to promote tourism in the area.

3. The member of the community should acquire the knowledge of tourism management, marketing and servicing tactics by asking for the training programs from the local educational institutes.

4. All the community's members should be proud of their way of life and present it to the tourists as the valuable identity of the community. This can be done by using the home use utensils as normally used in the daily life, staying in their wood-made houses, leading the tourists to do the merit making by offering the sticky rice to the monks every morning, dressing in the typical Chiang Khan costumes at all occasions.

5. All the members of the community should engage in all activities in the community. Above all, they should participate in the administrative side as well: such as deciding on the way they want the local tourism to be in the future. Preserving and conserving the products and services especially something that should be adapted or adjusted to the new concept of creative tourism. The tourists should have direct contact with the people's way of life. Only then they will have good experience of the service that make them one of the community's members, planning marketing tactics (by itself or joining nearby attractions; by conventional techniques

or use digital marketing), and spreading the benefits throughout the community.

### C. Recommendations for future research

1. The community's products and services development should be further studied to better fulfill the tourists and reinforce the community cooperation in order to encourage them to develop more products and services in the future.

2. The approach on digital marketing techniques should be studied for the growth of the community's tourism.

3. The sociological risk and environmental problems within the community should be carefully studied as soon as possible to confirm that the growth of the community tourism could be sustainable.

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# The study of factors that affect making decision of agro-tourism at Klong Mahasawat Community, Putthamonthon District, Nakhon Prathom Province

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## Abstract

This research firstly aimed to study the context of agricultural tourist destinations at Klong Mahasawat Community, Putthamonthon District, Nakhon Pathom. Secondly it aimed to study factors that affect agro-tourism within the same community. The research was qualitative research by using tourism's theory. This is the theory of factors that affect making decisions to travel. It also used the theory of agro-tourism as a frame of research. The area of research was the Klong Mahasawat community. For the research respondents were divided into 5 groups. These were senior people (2 persons), leaders of community (2 persons), group of housewife in local area (4 persons), local entrepreneurs (23 persons) and finally villagers who are effected by the tourism (4 persons). The total number of community members that were involved in the study was 34 people. In- depth interviews and observations were used as the primary data collection tools. The content of these interviews and observations was analyzed and descriptively written. The results of the research found the following; 1) The area where the Klong Mahasawat community is based has many agricultural tourist attractions. It was found to be convenient to travel to each place as tourists are able to travel by public transportation or private cars. It was found that the tourists were able to gain knowledge about agriculture and enjoy beautiful surroundings. The local people in the community all participate by welcoming tourists. 2) The factors that affect making decisions about agricultural tourism at Klong Mahasawat community were found to be divided into 2 parts as follows; The first part is the external factors that push tourists to visit. These consist of factors such as relaxing, health benefits, relationships, knowledge and activities. The second part is internal factors that attract tourists to visit. These were found to consist of tourism activities, local resources, society, culture, local lifestyle, products and facilities

**Keyword: agro-tourism, Tourist behavior, Making decision**

## I. INTRODUCTION

Tourism is an important industry that helps to develop economies in many countries around the world. It not only helps to increase revenue to the country but also helps to create opportunities for other industries. According to information from Department of Tourism, it was found that most tourists travel to visit Asia and Europe in 2018 as same as in 2017. There is ranking arrangement about 5 most visiting countries that tourists travel to in 2017. The 5 most visiting countries are China, United States of America, Hong Kong, Mexico and Thailand respectively. According to mentioned information, it's found that Thailand is 1 out of 5 most popular countries for travelling in the world. (www. prachachhat.net, online media). Thailand is the country where provides various tourist places such as natural tourist place, cultural place and historical place. The government has supported tourism and divided into 22 main cities such as Bangkok, Chiangmai, Phuket, Ayutthaya, Chonburi and Nakhon prathom etc. and alternative cities such as Ranong, and Samutsongkram (www. travel. trueid. net, online media)

Nakhon Prathom is one of main city in lower central part at Tha Jeen River and it is in perimeter of Bangkok. Nakhon Prathom is one of old cities and has long history with flourish

in the past. There are a lot of historical, natural and cultural tourist places including agricultural tourist places. The tourism strategy of Nakhon Phathom are 1) To develop basic factors of tours and develop tourist place, activities and tourism product 2) To develop standard and manage tourist places efficiently 3) To develop marketing and promote tourism proactively. Nakhon Prathom consists of 7 districts and the district which has interesting tourist places and is close to Bangkok is Putthamonthon District. This is one of districts in Nakhon Phathom that is efficient for tourism as there is important agricultural tourist place which is agricultural tourist place at Klong Mahasawat community

Klong Mahasawat has important history and it is routing for travelling for agriculture. Klong Mahasawat is the river connected with Tha Jeen River and Chao Praya River; therefore, it is designed to be tourism for experiencing agricultural lifestyle in community. There are a lot of places in this area such as temple which is Wat Suwannaram where is close to train station, port at Wat Suwannaram, Lung Jam's lotus field, amazing Thai Khao Tang at Baan Saladin, mixed field of agricultural lifestyle, Baan Fak Khao. Those are tourism resource of community. People in community need to take care and maintain those resources in order to make them

to be the places for educating about agricultural tourist places and tourist spots for travelers (agricultural community and Department of Agriculture at Putthamonthon District, Wattanatienpathom. 2011)

Therefore, the researchers are interested in studying factors that affect making decision of agricultural tourism at Klong Mahasawat Community, Putthamonthon District, Nakhon Prathom in order to know reasons that make tourists come to visit Klong Mahasawat Community including reasons that they select to visit Klong Mahasawat Community as now most travelers are interested in travelling different places such as department stores or the places that have been renovated to be modern.

## II. THE OBJECTIVE OF RESEARCH

1. To study context of agro-tourism at Klong Mahasawat Community, Putthamonthon District, Nakhon Prathom.
2. To study factors that affect making decision to have agro-tourism at Klong Mahasawat Community.

## III. CONCERNED CONCEPT AND THEORY

This research is about study factors that affect making decision to have agro-tourism at Klong Mahasawat Community; therefore, the researchers bring concepts and theories to be scope of study as

### *Concept of tourist behavior*

The factor that affects tourist behavior is motivation for travelling. This is main factor which is behind the behavior of travelling. The motivation for travelling is original reason that creates behavior of travelling. It helps us to understand the process of making decision to travel and it is able to be used to design and plan about developing tourist places. There are a lot of theories of motivation of travelling such as physical motivation, emotional motivation, conditional motivation and self-development. Moreover, other motivation attracts tourists to travel to different places such as surroundings that attract travelers to travel to those places. Therefore, it could be summarized that there are a lot of important factors of travelling so it depends on tourists and reasons that tourists travel to any place such as readiness, circumstance, reaction and result etc. (<https://www.tci-thaijo.org> 2017 searched on 22/10/18).

### *Theory of travelling motivation, Push Factory and Pull Factory*

It is travelling motivation. The travelling motivation of each person is from push factory and pull factory. The concept of push and pull is the theory that understands the study of travelling behavior and provides meanings as following;

Push factory is reason that is able to push something to require travelling such as

1. Requirement of taking a break is research that supports requirement of taking break is push factory of Beerli and Martin (2003). It found that requirement of taking a break is main push factory for travelers to travel to Spain.
2. Requirement of finding knowledge is the requirement of experience and new things. The research found that requirement of finding knowledge is push factory or main factor that makes requirement of travelling.

3. Reputation or requirement of reputation Hanqin & Lam (1999) found that reputation is push factory that Chinese travelers travel to Hong Kong and it is main encouragement for travelers.

4. Requirement of strengthening relationship between friends and family is research that found that requirement of strengthening relationship between friends and family is push factory or main factor that makes requirement of travelling.

5. Requirement of being adventurous and excited found that this requirement is main encouragement for Chinese female travelers to travel to other countries.

Pull factory is something that attracts to travelers to make decision to visit that places which are

1. Beautiful natural resources Li et al (2011) found that beautiful natural resources are main encouragement for Chinese female travelers to travel to other countries. The main motivation for Chinese travelers to travel to Canada is natural resources.

2. Notability of culture and history the research found that notability of culture and history is pull factory or main factor for travelling to other countries.

3. Safety Li et al, (2011) found that safety is main encouragement for Chinese main traveler to travel to other countries Jang & Cai (2002) found that safety is main push factory for British travelers.

4. Value for money Hanqin & Lam (1999) found that expense is main encouragement for Chinese travelers to travel to Hong Kong Haung&Hsu(2005) found that pull factory of Chinese people from main land to travel to Hong Kong is value for money.

5. Cleanliness Hanqin & Lam (1999) found that cleanliness is main pull factory for Chinese travelers to travel to Hong Kong.

6. Friendliness of local people (Correia) 2007 found that main pull factory that makes Portugal people to travel is the friendliness of local people.

7. Food it is main elements of travelling experience (Hall & Sharples, 2003) and it is able to be main motivation of travelling.

8. Accommodation Correia (2007) found that one of main pull factory of Portugal travelers is accommodation. Awaritefe (2004) found that accommodation is good motivation.

9. Opportunity of shopping the tourists are interested in shopping during travelling. It may be main reason of travelling (Timothy and Butler, 1995) is research that supports shopping is main pull factory. Li et al (2011) found that shopping is main encouragement for Chinese female travelers to travel to other countries. ( Kulkanlaya Na Pompetch, 2016)

### *Concept of making decision to travel*

Making decision of tourists to travel to somewhere from beginning to attitude after travelling has 3 factors which are 1) personal factors such as characters of citizen and pattern of living. These will present in forms of activities which are interesting and providing ideas and locations. Those are from time, surroundings and location which influence on making decision to travel 2) Psychological factor is indicator of

general behaviors and influences on travelling of tourists. It consists of knowing, motivation, attitude, personality and personal concept. 3) Social factor is encouragement of society that affects travelling. Making decision to travel is quitting process that has various ways to meet goal of travelling. Making decision is action that leads to success as per set goal by best way to meet goal and provide best result. (Somkid Bangmo, 2005. 175) (Factor of making decision of Thai travelers on travelling Wat La Praya floating market, Nakhonprathom 2016) As per above information, it could be said that process of making decision of travelers is process that travelers make decision that they will travel to somewhere or will use specific service to travel. The guideline that travelers use in making decision is from strategy of travelling that causes travelers to travel.

#### *Concept of Agro-tourism*

Agro-tourism is travelling that one of ways that brings lifestyle, culture and tradition. Most of villagers are agriculturist and natural resources are management system resource that comes from participation of community. It creates the growth of network of agriculturist's knowledge and brings to the process of transferring wisdom and agricultural technology to tourists and they can gain more knowledge Nion Srisomyong (2009).

#### *Pattern of agro-tourism*

Pattern of agro-tourism is a form of sustainable agro-tourism or travelling in natural resources that managed by human which is very popular now because population in every region of Thailand are agriculturists with the concept of the agriculture in a form of agro-tourism. Agro-tourism is divided into 5 categories as following.

1. Farming such as integrated farming, growing toxic free plants with fruits and digging fish pond or do farming and grow fruits together as in the form of fruit garden and grow most popular fruits and planting flower and Thai herbs.
2. Agricultural garden or private farm, the form of agricultural garden or private farm such as Sampran Garden and BN farm, Boonrawd Farm Mae Sa, Butterfly farm Mae Sa, Chiangmai and elephant farm and crocodile farm Sampran in Nakhon pathom.
3. Fishery, fishery means taking benefit from aquatic animals, aquatic plants by different way from catching, harvesting, feeding and transforming products for consuming in different forms.
4. Forest, area of economic forest and management of agro- tourism is managing forest in form of private forest that arrange area to sell and planting forest.
5. Culture, tradition and lifestyle that concern about agriculture, the tradition will concern about religion and ceremony such as ceremony to create courage for occupation (Department of Agriculture of Nakhon Prathom, 2018)

According to above information, it could be said that agro-tourism is divided into 5 categories but Klong Mahasawat's community has 2 kinds that are brought to present 1st kind is farming such as gardening which most people in community do about integrated farming and 2nd part

is culture which is Klong Mahasawat's community is long historical story; therefore, the old history such as villager's life style which is still exist such as travelling by boat in community as they are close to river.

#### **IV. DEFINITION OF CONCERNED VOCABULARY**

Agro- tourism is travelling that provides agricultural activities and has main travelling resource that is able to attract interest of tourist. The main goal is to make income for agriculturists in community in order for local people have participation about developing tourism. The form of agricultural travelling is one of the travelling forms of sustainable travelling Nion Srisongyong (2009).

Tourist's behavior is reaction of any activity that is similar forms or too often and become identity of group of people or person and there are factors that specify travelling such as personal factors and external factors. Personal factors are health, income, attitude, experience and external factors are politics, economy and society (Supalak Ackarangkul, 2012)

Making decision is using basic information from issues that are considering. Using basic information and summary that is acceptable and mix with referred summary in order to lead to goal and show direction of making decision Budsakorn Kamkong (1999).

#### **V. RESEARCH METHODOLOGY**

This research is a Qualitative research by studying factors that affect making decision of agro-tourism at Klong Mahasawat Community, Putthamonthon District, Nakhon Prathom. There are processes as following

1. Researchers study document, concept, theories and concerned researches of secondary data from many sources. The study consists of gathering information, selecting document and analyzing document and the information will be brought to create guideline of interview.
2. Bring interview pattern from 1) to do in-depth interview with concerned people about agro-tourism at Klong Mahasawat Community. The target is divided into 5 groups as following 1. Senior people who tell information of community's background 2. Group of community's leaders 3. Group of womanin community 4. Group of entrepreneur 5. Concerned villagers. Total target is 34 persons. According to issue that is analyzed from document, information of tourism's context in area of Klong Mahasawat about history and factors that affect making decision of agro-tourism at Klong Mahasawat Community.
3. Bring information to check correctness and analyze content, categorize content as per purpose, summarize, interpret and analyze in order to get overall information under process of studying and purpose of research and present study by narratively presenting.

#### **VI. RESULT OF RESEARCH**

1. From the research and interview, it found that area in Klong Mahasawat community in Reign II to Reign IV had digging canal to do business and industry to expand routing of trade and industry that is Klong Mahasawat. Moreover, it was

used as routing to pray respect Pra Pathom Chedi of King Rama IV. The poet in period of King Rama IV took photo of community of both sides of Klong Mahasawat in Pra Pathom Nirat. During the beginning of having this canal, it was explained waterfront pavilion of Klong Mahasawat and there were story of 7 pavilions as following 1) Sala Thammasop was the place used to do cremation in the past 2) Sala Ya which villagers called as the place to meet with people who produced medicine during that time 3) Sala Din was the place that villagers liked to do farming. Most of people in this area like to do rice farming and lotus farming. The villagers help to take care since in the part until now. Currently, Klong Mahasawat community begins to have many tourists to visit every day. For the community, they brought identity that is unique of community to be agro-tourism such as lotus farming, Baan Sala Din, Baan Fak Khao, Suan Paajaew, fruit garden of Uncle Boonlert and the main point of this place is sailing on boat to see lifestyle of people in Klong Mahasawat community. There will be uncles and aunts in the community take us to see or they will control boat and take us to see lifestyle of people in community. While sitting on the boat, they will tell history of this community, the reason why it is agro-tourism. Apart from seeing surrounding of community, we also have a chance to listen history of people in community. Therefore, Klong Mahasawat has identity and charm that attract to a lot of tourists to visit this community. Moreover, Klong Mahasawat is very famous among tourists who travel to visit. Therefore, it is an advantage for new travelers who are interested in agro-tourism because traveler will have chance to learn life style of people in Klong Mahasawat and also they are able to learn how to do farming here in order to be guideline for living or model of agriculture.

2. The factors that affect making decision to visit community. It's found that it is able to divided into 2 parts which are

1. Internal factors that affect making decision to travel to community consists of 5 aspects as following

1.1 Relaxing means to break something that causes body and mind feel tired. Relaxing will help body and mind recover from beingrom doing things and are able to do something efficiently than before taking a break. It is divided into 1) Work and learn hard are studying in classroom that has a lot of content or too difficult or have many assignments and they do not have time to do what they prefer and sometimes learning too much may cause daily life change and bring lots of stress. 2) Working too hard is working that has a lot of things to do or colleagues do not provide good cooperation 3) Require to reduce stress is having a lot of thing to do which is too hard or a lot of thing; therefore, they feel too much stress. This causes their body needs to release stress in order for their health to do something without stress. 4) Want to avoid monotony is being in the same place with same people and circumstance or others for long time causes people feel bored with old thing and wand to go away from old things 5) Would like to have joy and amusement is stress that is in mind for long time until mind would like to have something fun to feel happy in order to feel relaxed from existing stress.

1.2 Health means status of body is indicator if body is normal or not or condition that requires treatment or not.

Health will affect mind; if health is good, mind will be good also. But if health is bad, mind will get effect also. It's divided into 1) Pure air is air without pollution which is harmful to health. Being in pure air place will help body to get pure air and your body and mind will feel relaxed 2) Getting cure by herb is the condition that health is bad by sickness and body cannot cure themselves; therefore, herb will be used to cure as it is natural substance. 3) Taking care skin and beauty is reducing or delaying deterioration of skin to be the same or better condition. Taking care skin is supplement of beauty that will help people to feel confident when they do something 4) Having fee chemical vegetable is having vegetable that is really from nature will help people to avoid having chemical into body which is from vegetable that use chemical in growing process. This helps people to have good health 5) Massage is when body has pain and feels fatigue from working. Massage is pushing some spot or loosening and stretching muscle by different ways from experts in order for body to feel relaxed and feel free from pain.

1.3 Strengthening relationship is human has bigger community and bigger community creates better relationship and human want that good relationship lasts forever; therefore, strengthening relationship is good way. It's divided into 1) family is first group of society and it is most important society of human as it is society that consists of beloved people and respect to each other and those people have effect on each other.

2) colleagues are people that work together in the same place; therefore, they need to trust each other and help each other while they work together 3) lover is two persons that have good feeling for each other and they develop their relationship to be love and that love will be able to develop to be society of family that live together 4) Organization is people who work together systematically and they have clear position with department and lots of department will become organization which depend on cooperation from every parts in organization in order for organization to grow in the future 5) local people are people who live in the same area; therefore, their lifestyles are similar and there is cooperation in community in order to develop local area to be successful in the future.

1.4 Finding knowledge is people who want to know new thing that they have never known before and they would like to know and understand what they want. Finding new knowledge will help them to develop themselves from knowledge that they gain. It's divided into 1) Agricultural community is doing agriculture in local area or village that they live; therefore, agriculture in community is similar to each other and people are able to study and exchange knowledge about agriculture in community 2) Study is people learn necessary thing for living and it is necessary for living together in big society. Studying help human to have more ability and it is indicator of position in society for human also 3) Learning community lifestyle is learning information to understand lifestyle of community that they want to study as each community is different. Therefore, people need to understand difference of each community 4) Development is making something better and be more modern and it leverages

that thing not to be old. 5) Field trip is travelling some place and study and find knowledge from that place or visiting place that provide knowledge of we want to know.

1.5 Activities mean human do something together and they are interested in the same thing. They do it to have fun together and get knowledge and develop potential in that specific thing. It's divided into 1) Adventure and being excited are visiting challenging place and there are lots of obstacle and make people feel excited about solving problem from adventure 2) Doing agriculture activities is doing something about agriculture to get new knowledge and get new process to develop agriculture to be better 3) Being volunteer is doing useful thing for public with freewill and require no benefits from doing that 4) Walk rally is activity or game that play as a group of people who have same interest in order to strengthen relationship in society 5) Camping is group of people who have same interest and would like to visit place to find information in order to study something clearly.

2. External factors that affect making decision to travel to community consists of 5 aspects as following

2.1 Activity is each community has tourism activity that is able to accommodate tourists to visit and provide activities that tourists are able to do when they come to the places. The activities will be divided into many types as it depends on natural resources of that community. It's divided into 1) Beauty is activity that concerns about beauty such as skin, body that affects inner beauty of each person. The community will provide activities about beauty. 2) cooking class is the process of cooking for eating or trying and tourists are able to do by themselves when they travel to visit in order for fun 3) Adventure and exciting are activity that is exciting and provide chances for tourists to challenge their courage and adventure helps to make travelling more fun 4) Agricultural activity is the thing that concerns about agriculture that depends on agricultural lifestyle to be an indicator of doing agriculture such as rice farming, raising cattle, planting vegetable 5) Base of learning is the activity that divides learning into many places in community and the knowledge will be about tourism in community.

2.2 Local resources are useful and valuable things to that community and each community may have similar or different local resources. It's divided into 1) agricultural area is area that people use to do agriculture such as planting, farming, gardening which is main occupation of local people 2) Buildings are house, building, school, temple or any places in community that have been built for living for doing agriculture and for tourism 3) Tourist spot is local resources that exist then there is travelling to community. Those places will be presented as tourist spots in community 5) nearby community is resource or tourist place in nearby area such as tourist places 5) Surroundings are natural condition of community and it help to created surroundings in community.

2.3 Society, culture and local lifestyle are parts of people in that community. There will be many aspects such as society and culture. It is divided into 1) lifestyle of people in community is living style of people that crates living style of people in community 2) community's tradition is tradition that happened for long time in community and people have practiced for long time. 3) identity of culture is the unique

point of community that create reputation and people keep following 4) beliefs and faith are tradition that has been believed since in the past in community and people have faith with it 5) local amusement is activities that happen in community and create joy for people in community and for relaxing.

2.4 Products are the products of community and made from people in community. It's divided into 1) from group of woman is activity that create for woman to spend their time usefully and gain more income in community 2) from agriculture is products that are from agriculturists in community such as fruits from garden of people in community or rice from farm in community 3) from community is the products that made within community and people has participation about making this product 4) from tourist spot is there are products from every tourist spots and sometimes is from travelers who try to make the products by themselves or owner of that tourist spots 5) reputation of products is products that have got good reputation among tourists.

2.5 facilities are things that have been provided to serve tourists in those places and it increases convenience for tourists. It's divided into 1) accessibility is travelling to those places by any vehicles in order to provide convenience for travelling 2) services is providing convenience for tourists who travel to visit community or tourist spots 3) accommodation is service of accommodation of tourists who travel to those places 4) restaurant is the service of food that concern about food and places that are available in tourist spots 5) photo spot is the places that provided for taking photos for traveler to share on social media or for beauty.

## VII. DISCUSSION

The context of Klong Mahasawat community is the interesting community as it is famous agro- tourism places and popular among people for both small group and big group within community or big group of province, region, country and other countries also because this community has long history and famous. This concept is from theory of pull factory (li et al 2011). It's mentioned that Nakhon Pathom province has a lot of tourist attractions especially in area of Klong Mahasawat community that has agro-tourism and it is convenient to travel to each place by public transportation or private car. Ago-tourism of sailing boat to see Klong Mahasawat is from concept of bring lifestyle of agriculturists to integrate with "natural assets" which are agriculture, garden, farming, rice farming and tourists will gain knowledge about agriculture such as lotus farming, food transformation of group of woman, doing integrated orchid garden, growing bitter cucumber. In addition, tourists will enjoy beautiful view by tourism activities that related with concept and pattern of agro- tourism. (Department of Agriculture of Nakhon Pathom 2018)

The study from interviewing target that concerned the agro- tourism of Klong Mahasawat Community has been done. Community tourism and agro-tourism attract tourists to visit tourist spots in community by using concept of tourist behavior (<https://www.tci-thaijo.org> 2017 searched on 22/10/61). The first ranking is tourism activity. There are a lot of activities in Klong Mahasawat community for travelers to



select. There are tourist spots as following 1) Port point is the place for listening to history of Klong Mahasawat; it will be about story and background of Klong Mahasawat community. How many tourist spots they have and its unique points of each place 2) Lotus field of Lung Jam has activity of paddling boat to see lotus field. When tourists reach lotus field, they can paddle boat to pick up lotuses or view them. There will be someone bring tourists to take a photos and see the lotus. When they go up from seeing lotus field, they will learn how to fold lotus to add value for praying respect to Buddha image. 3) Amazing Khao Tang Thai has activity of learning how to transform Khoa Tang. The tourists will learn how to bring leftover of rice to cook tasty dessert. They are able to cook by themselves and create products that make income for their community. The integrated farm and group of woman that produce fruit transformation and food have activities as following, they will sit on E-tan to experience nature in the garden. There will be excited and fun for tourists who visit Klong Mahasawat 4) Baan Fak Khao has activity of learning how to grow Fak Khao. This is learning activity about how to grow Fak Khao and get best products. They will learn how to transform Fak Khao 5) Orchid garden has activity of learning how to grow orchid and how to take care and how to make it produce lots of colorful flower

Those activities make both lots of Thai and foreigner tourists' travel to visit this community. The motivation of travelling in this community are various and it bring tourists travel to many places. Each person has different motivation (theory of motivation, push factory (Beerli and martin 2003). Therefore, external factors and internal factors have effects on tourists and tourist attraction so much as same as Klong Mahasawat. Relaxing of travelers in Klong Mahasawat community is agricultural community which is the tourist spot that is suitable to travel for both short and long trips. The community provides homestay to accommodate tourists and the tourists are able to take a rest and learn lifestyle of people in the community which people in Klong Mahasawat community do garden, farming and growing fruits and still have requirement to know new things from community such as cooking Kjaio Tang, Mieng Bua Luang and rice fold with lotus leaf. In addition, it is the way to strengthen good relationship with friends and family. Moreover, there are internal factors in community that attract to tourists to visit Klong Mahasawat such as abundant resources of community and culture and original tradition of agriculture and lifestyle of local people. Moreover, the local people are very friendly and the place is safe.

There are many shops in the community and there is an opportunity for tourists to buy souvenirs for their beloved ones. In the last past is value for money that they have a chance to visit community. Not only getting safe product that made from natural material, the price is not expensive also for tourists who are interested in buying products as per the theory of making decision to travel of (Somkid Bangmo, 2005. 175) that affects travelling in Klong Mahasawat community.

## VIII. SUGGESTION FROM RESEARCH

### 1. Suggestion for taking result of research to apply

1.1 From the result of research, it found that Klong Mahasawat community has unique lifestyle and has outstanding identity. Moreover, natural resource of community are various so many tourists travel to visit. Therefore, the facilities should cover more in order to increase potential to accommodate tourist efficiently.

1.2 From the research found that the factors that have effect on making decision of travelling will have push factory for tourists would like to travel and there will be pull factory from tourist attractions and community attract tourists to visit.

### 2. Suggestion for next research

For the future research about Klong Mahasawat community, researchers should do research about guideline of maintaining tourist resources to be in good condition in order for forever sustainability

## IX. CONCLUSION

From the context of Klong Mahasawat community, Putthamonthon District, Nakhon Prathom, it found that Klong Mahasawat community has many tourist resources and they are enough to serve many targets of tourists. There are the agro-tourism resources or cultural, traditional and local lifestyle resources. These are important parts which attract tourists to visit Klong Mahasawat. However, Klong Mahasawat community has to develop potential of tourism continuously to serve tourists who will be travelling to community. The tourists who travel to visit have factors that affect making decision to travel to community. The factors have been divided as external factors that push tourists to travel; it consists of relaxing, health, relationship finding knowledge and activity. It's also divided as internal factors that attract tourists to travel; it consists of tourism activity, local resource, society and culture, local people lifestyle, product and facilities.

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# Guidelines for developing evaluation criteria of tourism trend indicators in capturing, tasting and sharing in Nakhon Pathom province

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## Abstract

This study aimed to develop guidelines to develop criteria of Tourism Trend Indicators in Capturing, Tasting and Sharing in Nakhon Pathom Province by using the following tools. These were the travelling concept, travelling to eat and drink, evaluation criteria, future research and the Delphi technique. The statistics are used to analyze information and used as scope of research were also investigated. The area of research was 8 restaurants and drink shops in Nakhon Pathom. The target group is of the research was experts or specialists in marketing, services, photography, public health, tourism and sports and owners of restaurant and drink shops. In total 17 people were interviewed across the 8 establishments. Purposive sampling was used along with the Delphi technique.

The researchers studied information and found that Delphi is a methodology that at the time of writing is quite popular. It was used to interview and gather information from experts or specialists and owners of restaurants and drink shops. It was found to be one of the best methods of data analysis for this research. This research concludes that the Delphi technique was useful in evaluating data and meeting the objectives of the project.

**Keyword: developing criteria, indicator, capturing, tasting and share**

## I. INTRODUCTION

Group of Gen Y traveler is a group that considers travelling is not only normal visiting but it is looking for materials that used to create trend to share on social media. Moreover, they are group that most use internet while they are travelling or 83.3%. Gen X travelers are ranked in 2<sup>nd</sup> for group of travelers who have buying power or 67.2%; the 1<sup>st</sup> rank is Gen Y travelers. Due to this information, Tourism Authority of Thailand considers Gen X and Gen Y people are one of targets that create growth of business for 12%. Therefore, they create new routing for travelling which provides interesting places and activities. This help to motivate travelers through online social media in deep travelling in 12 cities where we cannot miss. The famous bloggers will recommend and provide information for Gen X and Gen Y people (Thaicoon Brandage Co.,Ltd, 2018). Deep Travelling Project for 12 cities where cannot be missed provides program for recommending places for visiting, eating and staying in each province. There are famous bloggers of Thailand for 12 pages such as Tiew Mai Krub, Journey Aholi, La Pak Tiew, Pai Kon Diew, Tiew Tour Thai-Pai Nai Dee and Bantuek Konkeetiew etc. Moreover, there is travelling that is popular among international level which is Gastronomy Tourism. It's travelling that has travelers travel as per their real interest in food. Because of interesting and motivation of these travelers, Ministry of Tourism and Sports considers that Thailand is suitable for providing this kind of program as Thailand has potential about food also. (Triptravelgang, 2018)

Nakhon Prathom is one of provinces that is on 56 kilometers far from Bangkok and the area is connected with Supanburi, Samutsakhon, Ratchaburi, Nonthaburi, Kanchanaburi, and Ayutthaya. It is considered as province that

leads to these provinces and it is convenient travelling and there are lots of restaurants. Travelers like to search information via technology in many pages. From the study about indicators of trend tourism of capturing, taste and share in Nakhon Pathom (2017), the researchers consider that Gen X and Y like to visit coffee shop because interesting decoration in restaurants and menus of food and drinks are unique. From the information of research, the researcher study about suitable indicators of restaurant and drink shops that are popular in online social media of Nakhon Prathom from all indicators 7P's, we have known about opinion from experts who show result of commitment of each process. They agree on each indicator. Therefore, the researchers have concept to study about developing evaluation criteria of travelling for eating and drinking in Nakhon Prathom to attract travelers who want to capture, taste and share in Nakhon Prathom in order to get evaluation form of restaurant and drink shops business in Nakhon Pathom and they are able to bring evaluation form to evaluate their business and how much it meet the requirements in order to be set in criteria of tourism trend capturing, tasting and sharing in Nakhon Pathom.

## II. RELATED CONCEPT AND THEORY

### 1. Definition of vocabulary

Tourism trend is traveling to some place that is popular but it is not popular for so long as there is quick trend and depends on fashion in order to create participation and acceptance from society at some time. This is tourism trend capturing, tasting and sharing in Nakhon Pathom

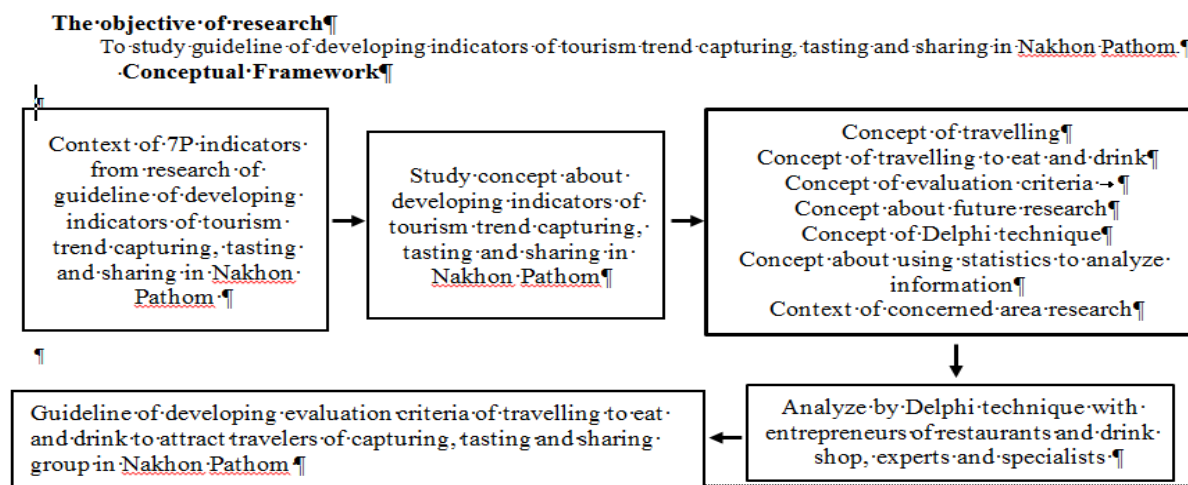


Fig. 1 Conceptual Framework

Travelling to eat and drink is travelling to experience about food and drink at local place in order to learn lifestyle and local culture (Kobkarn Wattanawarakul, 2015)

Capturing is taking photos to keep memorable moments from travelling. Travelers would like to take photos to save as good memory for them. Taking photos which is on current trend is selfie with friends or groups with each places. This is a travelling trend capturing, tasting and sharing in Nakhon Pathom.

Taste is tasting through tongue in order to try and know the taste of food and drink. This is a travelling trend capturing, tasting and sharing in Nakhon Pathom.

Share is bringing information that they know and learn to share and exchange with other people in order for them to know and experience also. They do this through online technology on online social media in order to make other people to be interested in and follow. This is a travelling trend capturing, tasting and sharing in Nakhon Pathom.

Group of Gen X traveler is people who have high self-confidence and like challenging, changing and development. They are active and work hard to earn money for travelling; therefore, they are a group that has money to afford. The travelling of this group of people focuses on family and they will travel when they consider well. (Luerat Anuratpanich, 2010)

Group of Gen Y traveler is people who are not quite patient with old style of working and they like to find something that presents the identity of themselves. Therefore, they are being themselves and their travelling focuses on new and unusual things and they like to travel by themselves. Therefore, the traveling style of this group is not visiting important places. (Luerat Anuratpanich, 2010)

## 2. Concept about Travelling

Travelling is an activity about traveling for relaxing. The time is limited and it is temporary travel including domestic and international travelling but not for working (Boonlert Jittangwattana, 2005). The important of travelling

helps to make revenue to country, economy, society and culture for better living (Pittaya Sriwattana, 1990). Form of

travelling is divided into main types as following travelling to natural places, travelling to cultural places and travelling to special interesting places. (Amornrat Pornlor, 2012)

Gastronomy Tourism or Food Tourism Food tourism is travelling to taste food and drinks in local area to learn lifestyle and culture in local place (Kobkarn Wattanawarakul, 2015). This happens from the motivation of travelers who choose to have food tourism and it is requirement of travelers that would like to do something and accomplish (Hawkins, 1998). Moreover, there are factors that influence on food tourism to be popular in the future. Those are change of population, sustainable tourism, unique style of travelling, new technology and new motivation. (Tomorn Sookpricha, 2017)

Concept about evaluation criteria Evaluation criteria is evaluation and testing development that make change on something to different condition that is better than old version. There are types of evaluation development which can be divided into 3 groups which are criteria development for project evaluation (Boonchom Saard, 1992), criteria development for operation evaluation (Suwimol Wongvanich, 1993) and criteria development for evaluation that based on standard (Uthumporn Jamornman, 1994)

Concept about future research Future research is study that tends to require and not require and different options that present possibility in the future and possibility in many directions that can be happen (Jumphon Poolpattaracheewin, 1982 and Duangnapha Makaranurak, 1981). The research of objective of future research is to describe options in the future in order to evaluate current situation to indicate possibility in the future to remind in advance and to understand changes.

Concept of knowledge about Delphi technique Delphi technique is the process that gathers and defines knowledge from experts from unnamed questionnaire that provide chance to present opinion freely. Moreover, the opinion will be repeated. It is technique of gathering of making decision to conquer weak point of making decision (Chailikhit

Sroipetchkasem, 2012). Delphi technique has many elements that make Delphi accomplishes and it will gather information 3-4 times as following 1<sup>st</sup> round is opened question, 2<sup>nd</sup> round is closed question, 3<sup>rd</sup> round is repeated question, 4<sup>th</sup> round is repeating and summary (Chailikhit Sroipetchkasem, 2012 and Nikom Lainchua, 2014)

Concept about statistics used to analyze information Median is value that is at the middle position of all values. The information will be in order from smallest to largest values or from largest to smallest numbers. Mode is value that has highest frequency and used as average of information and used with quality information. Quartile is measuring position that divides total information that is in order from smallest to largest numbers into 4 equal groups. Each group consists of number of information  $\frac{N}{4}$  when N represents numbers of information and use Q as symbol (Piboon Chomsombat, 2002 and Opendurian Co., Ltd, 2017)

## II. RELATED TILLER TIER

Supakorn Prathumthin (2010) studied about creating form of cultural tourism program to be sustainable as per Sufficiency Economy by ThaiYai community in Baan Thamlord, Pangmapha District, Maehongson. This purpose was to create form of cultural tourism program of ThaiYai community in Baan Thamlord, Pangmapha District, Maehongson to be sustainable as per Sufficiency Economy. The community had participation and this research proceeded by using Delphi Technique. There were 15 experts in this research. There was evaluation of research's result as per the process of gathering information for 3 rounds. 1<sup>st</sup> round was interview and 2<sup>nd</sup> round and 3<sup>rd</sup> round were interview. The interview consisted of concerned information about research for 89 statements. The analyzing information for 3<sup>rd</sup> round questionnaire by considering from Median, Interquartile Range, Difference between Mode and Median and there was the process of Participatory Rural Appraisal (PAR). The opened interview with sample which is population who lived in Baan Thamlord for 42 persons was done.

The of research found that group of 15 experts showed the important elements of creating cultural tourism program in Baan Thamlord for 4 elements which were 1) Community 2) Concerned department 3) Policy 4) Entrepreneur and they had effect on Sufficiency Economy which consisted of ethic, sufficiency, good immunity, condition of knowledge and condition of moral. The interview of population in the community of Baan Thamlord had compatible that they want Baan Thamlord became cultural tourism place

Narinee Yamsakul and team (2011) studied about developing indicators of efficient evaluation of primary care unit of Office of Permanent Secretary, Thailand. The purpose was to develop element of indicator and evaluation of efficiency of primary unit care of Office of Permanent Secretary, Thailand. The research had been divided into 3 periods which were 1<sup>st</sup> period creating element of indicators and efficient criteria from reviewing literature of concerned research and opinions from experts in high level, 2<sup>nd</sup> period selecting indicators by using Delphi Technique in order to get suitable indicators, 3<sup>rd</sup> period checking form and confirm structure of elements and indicators.

The empirical evidence by analyzing elements as a tool of research was done. It consisted of structure interview, questionnaire for experts and evaluation form of possibility. For gathering information, researchers had the process of gathering indicators from chief or representatives who worked in primary unit care. The statistics used to analyze information were descriptive statistics and analyzing confirmed element. The result of research found that indicators from reviewing document, literature and concerned research of efficient evaluation and efficiency of primary unit care in Thailand and from other countries had total 218 indicators. After selecting indicators by using Delphi technique for 3 times and got indicators that met the selecting standard for 58 indicators. The analysis of confirmed element was used got indicators of evaluation of efficiency of primary unit care for 56 indicators that had possibility for gathering information to evaluate efficiency of primary unit care.

Jitrapon Tarapitakwong (2012) studied about developing criteria and indicator of quality OTOP product about fineness of producing handicrafts such as appliances, decoration and wooden souvenirs by using analysis hierarchy process. This research aimed to 1) to study criteria and indicators of quality OTOP products that influenced on evaluating quality of OTOP products about fineness of producing handicrafts such as appliances, decoration and wooden souvenirs 2) to rearrange and use the criteria and indicators of quality of OTOP products that that influenced on quality of products by using using analysis hierarchy process. The analysis weight of importance of criteria and indicators was done and the experts were the people who considered weight of importance of criteria and indicators from the ratio of diagnosis couple comparison. The result of couple comparison of each indicator's pair was brought to analyze from weighting importance of criteria (main criteria) and indicator (alternative criteria). The result of research in the study of criteria and indicators that influence on evaluating quality of OTOP products about fineness of producing handicrafts such as appliances, decoration and wooden souvenirs was done. The rearrangement of importance of criteria and indicators of quality of products by using analysis hierarchy process was done. Therefore, the entrepreneurs of OTOP products should focus on criteria of assembling products, general traits of products, design of products and indicators of crack from glue that used to attach products, crack, breaking, being not convex, being not smooth in order to leverage standard of OTOP products. Pattamaporn Kongdee and team (2017) studied about indicators that experts had opinions that were suitable to indicate developing indicators of tourism trend capturing, tasting and sharing in Nakhon Pathom. The research had interesting issues to be discussed as following 1) Quality of coffee (species/ smell / taste / creativity of menu) 2) Satisfactory of food and drinks 3) Suitable price of drink 4) Suitable price of food 5) Accessibility by land 6) Advertisement via words of mouth 7) Advertisement via publishing 8) Advertisement via online social media 9) Advertisement via TV, Radio 10) Owners have serviced mind 11) Owners have good attitude to service 12) Owners are friendly 13) Staffs have serviced mind 14) Staffs have good

attitude to service 15) )Staffs are friendly 16) Have working skill and understand system 17) Size of restaurant and shop 18) Cleanliness of place 19) Cleanliness of food and drink 20) Service as resting point 21) Have point for taking photos 22) There are enough tables and chairs 23) Have parking spaces 24) Smoking area is available 25) Facilities of communication such as Wifi and electricity charge points are available 26) Toilets are available 27) Hygiene of staffs (cleanliness / hairstyle / faces) 28) Recommending menus of restaurant and shop 29) Serving food 30) Safety 31) Time of opening and closing. All of mentioned indicators were from the experts who had the same opinion and were very suitable. Moreover, the entrepreneurs focused on running business of food and drink by using marketing mix 7P's to apply with restaurant and shop management to serve requirement of customers and show positive image to the view of customers.

### III. RESEARCH METHODOLOGY

This research aims to study the developing criteria of indicator of Tourism Trend Indicators in Capturing, Tasting and Sharing in Nakhon Pathom Province. There are 3 steps of methodology as following details

#### 1<sup>st</sup> Step

The researchers study document and concerned research in order to get information for study and set framework of information to cover study topic to get information as per requirement. The concerned concept in this study consists of tourism theory, food tourism, developing criteria of evaluation, future research, Delphi technique and statistics for analyzing information.

#### 2<sup>nd</sup> Step

The researchers proceed to study document about future research in order to get information that used as theory of study developing criteria of indicator of tourism trend in Capturing, Tasting and Sharing in Nakhon Pathom Province. This research helps researchers know about process, selecting technique of future research to be guideline of developing criteria of evaluating food tourism to attract travelers of capturing, tasting and sharing in Nakhon Prathom

#### 3<sup>rd</sup> Step

The researchers proceed to study document of future research to get information of guideline of developing criteria of evaluating food tourism to attract travelers of capturing, tasting and sharing in Nakhon Prathom. The researcher select Delphi technique to be theory of study developing criteria of indicators of tourism trend capturing, tasting and sharing in Nakhon Prathom. From the information about bringing Delphi technique to evaluate for 9 researches in order to get conclusion of the best research methodology of research of researcher, the team decided to study to get result as per objective of research.

### IV. RESULT OF RESEARCH

From the objective to find guideline of developing criteria of evaluating food tourism to attract travelers of capturing, tasting and sharing in Nakhon Prathom, the researchers know the guideline about future research. Therefore, researchers are able to classify as following 1) Trend Extrapolation is studying future from tendency 2)

Delphi Forecasting is the way to study from expert's opinion 3) Matrix Forecasting is the technique that shows tendency or events and how they affect each other 4) Futures Wheel or future wheel is technique that evaluate internal stability of forecasting tendency 5) Simulation Technique is creating artificial future 6) Scenario Technique is writing story about future 7) Ethnographic Futures Research is future image from one interviewing 8) Ethnographic Delphi Futures Research is research methodology from first interview and using Delphi technique in 2<sup>nd</sup> round and 3<sup>rd</sup> round 9) Relevance Tree and Contextual Map Forecasting is technique of forecasting using relevance tree and contextual map 10) Cost – Benefit Analysis is technique that indicates expense and process of problem solving 11) Systems Analysis 12) Technology Assessment is forecasting and planning systematically 13) Operations Research 14) Monte Carlo Analysis Forecasting 15) Morphological Forecasting 16) Alternative Futures 17) Bayesian Statistical Forecasting 18) Force Analysis Forecasting 19) Maskov Chain Forecasting 20) Precursor Forecasting, From studying information, the researchers know concept of Delphi which researchers study carefully from concerned document of researches that used Delphi technique in the researches. Therefore, researchers know the suitability of applying to be tool and concept of gathering information from interviewing experts or specialist and entrepreneurs of restaurant and food shop including process of gathering information from experts to be usefulness for researchers about gathering information and know the criteria of evaluation of food tourism to attract travelers capturing, tasting and sharing in Nakhon Prathom also.

### V. CONCLUSION

From the study of guidelines for developing evaluation criteria of food tourism to attract travelers in Capturing, Tasting and Sharing in Nakhon Pathom Province and the study of developing evaluation criteria of Tourism Trend Indicators in Capturing, Tasting and Sharing in Nakhon Pathom Province, the researchers know the concept of future research that help researchers know meaning process and each technique of future research.

Moreover, researchers know the Delphi technique which is suitable to apply as tool of research and researchers have studied from 9 researches that used Delphi technique to use; moreover, the researchers know about advantage and limitation of Delphi technique. The advantage is it is able to gather information from people who provide information that are various and discuss together without showing name and surname. This will help to reduce effect about influence on showing opinion. In addition, there will be limited time of consideration before sending information back in each round. When specialists answer in the 1<sup>st</sup> round have chance to get feedback of 1<sup>st</sup> round and they are able to review their opinion and they will have idea and opinion that more correct. The researchers who use Delphi technique will find that using questionnaire as per Delphi pattern help them to get correct and useful information more than interviewing from experts or when they have discussion. The limitation of this technique is using long time to gather information which causes the people who provide information leave group or do not provide

cooperation; therefore, researchers should follow up continuously.

## DISCUSSION

For the study of creating criteria for evaluating indicators of Tourism trend capturing, tasting and sharing in Nakhon Prathom, the group of researcher know the concept about future research. The study of concept of future research was mentioned from people that new subject that study about concept and theory about future research and methodology that was used in this research. It had required and not required tendency and options that show possibility in different directions. Therefore, there is "S" in the end of future to reflect concept of futures about possibility in different directions. Therefore, researchers need to explore and study tendency of possibility or bring to be the subject that they will study as much as possible Jumphon Poolpattaracheewin (1982) and Duangnapha Mokaranurak (2011)

The objective of future research is to have option in the future to evaluate knowledge of the person who interview about future to know about result in the future to remind in advance and understand the changes Pornchulee Archeewabamrung (1994) Technique of future research Wiroj Sararattana (1989) is able to classify 1) Trend Extrapolation is studying from tendency 2) Delphi Forecasting is studying from experts 3) Matrix Forecasting is technique that shows tendency or events that how they have effect on each other 4) Futures Wheel or future wheel is technique that evaluate internal stability of forecasting tendency 5) Simulation Technique is creating artificial future 6) Scenario Technique is writing story about future 7) Ethnographic Futures Research is future image from one interviewing 8) Ethnographic Delphi Futures Research is research methodology from first interview and using Delphi technique in 2<sup>nd</sup> round and 3<sup>rd</sup> round 9) Relevance Tree and Contextual Map Forecasting is technique of forecasting using relevance tree and contextual map 10) Cost – Benefit Analysis is technique that indicates expense and process of problem solving 11) Systems Analysis 12) Technology Assessment is forecasting and planning systematically 13) Operations Research 14) Monte Carlo Analysis Forecasting 15) Morphological Forecasting 16) Alternative Futures 17) Bayesian Statistical Forecasting 18) Force Analysis Forecasting 19) Maskov Chain

Darunsil, 2014 Kaweesak Jittawattanarat, 2015 and Preeyawadee Pholaneek, 2018)

Forecasting 20) Precursor Forecasting. From studying information, the researchers know concept of Delphi and it is concept that researchers select to use as tools for gathering information of interview from experts or specialist. The entrepreneurs of restaurant and drink shop in Nakhon Prathom say that Delphi technique is the process that depends on process of gathering information and defining knowledge from experts that from communication of experts from questionnaire and control opinion by without showing names of expert in order for giving opinion freely and it is the opportunity for the experts to review their opinion and diagnosis of group officially. Chailikhit Sroipetchkasem (2012) The elements that make Delphi technique be successful consist of time which is important part of following up information from experts and the experts need to have real

ability and are pleased to take time to complete questionnaire. In addition, the questionnaires should have quality and be easy and clear to understand. The researchers have to understand process of analysis and have enough time to send and gather information. They should be careful and consider answer carefully. The process of Delphi technique consists of setting problem of research, selecting experts, creating tools that used in research and gathering information. The gathering information is divided into 3 – 4 rounds and it will depend on result of research of each round. Typically, it will take time to send and reply questionnaire of each round at less than 2 weeks. Therefore, the analysis by using Delphi technique will take time around 2-3 months and the conclusion of analysis. Nikom La-inchua (2014).

The advantage of Delphi technique is the technique that will not disclose information of people. It can gather information widely and information is reliable. The results are considered carefully and the process of exchanging idea without facing. The compatible is measured from statistics which is the gathering of information that provides freedom of idea. Even though, it is not process but it is based on knowledge of processing. The limitation of Delphi is taking time to complete questionnaire for many times and limit framework of idea and there is bias about answer of each round. Questionnaire may the best dining the process and no deliberation of information. The analyzing process is long and the answers are forced to be in the middle of commitment and taking time to wait for questionnaire. (Suwimol Wongwanich, 2005 Duangnapha Srinantawong, 2005 Sutita Khattiya, 2009 Kovit Boonmeepong, 2012 Narongrit Kittikawin, 2013 Mangkornkaew

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# The study for a public relation media development guideline to promote the agro-tourism of Huai Muang communities, Kamphaeng Saen district, Nakhon Pathom

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## Abstract

This research had objectives to 1) Study the context of Huai Muang community, Kamphaeng Saen district, Nakhon Pathom province and 2) Study guidelines for the development of public relations media in order to promote the agro-tourism attractions of of Huai Muang community. Qualitative research was carried out which used the theory of tourism, the theory of agro-tourism and the theory of tourism by the community. The research area was Huai Muang community area, Kamphaeng Saen district, Nakhon Pathom. The target groups consisted of people from the district administration organization, the department of agro-tourism, community leaders, enterprise community leaders, shop owners and the residents of the area of Huai Muang community. The tools and approaches that were used in the research were In-depth interviews and observation and analysis. These were used to collect information which was then analyzed and transformed into a descriptive explanation.

The findings of the research were as follows; 1. Huai Muang community is a community in Nakhon Pathom province. The community has a canal passage cut through the area which has made it sustainable for farming, it has developed its natural resources and the livelihood of the community members. With regards to the second objective of the research it was found that 2.1 Public relation media that is suitable to develop and promote the information can be divided into 3 types of media. These were personal media, printing media and mass media. An analysis of the public relation media development was carried out and it showed that the guidelines can be divided into 4 stages. These were as follows 1.) Planning 2.) Communication for public relations 3.) Human resources and 4.) Result evaluation.

**Keyword:** Agro-tourism, tourism by the community, public relation media

## I. INTRODUCTION

Tourism is a type of service providing industry and it also involves with various of the other industries such as the hotel business, restaurant, and travel agency business. All of the mentioned business lead to the employment and investment. As a result, tourism is considered as the industry that generates revenue for the country and also boost up the economy. (<https://tourismatbuu.wordpress.com/> Search on 06/09/2018)

In Thailand, agro-tourism is a popular form of tourism. The agro-tourism is to visit the agro community, herb garden, livestock and farm to appreciate the beauty and the success of the business as well as participating in the different kind of activities. Therefore, agro-tourism is type of tourism that involves the local way of life, culture, tradition, the occupation of the farmers and the natural resources and integrate these components into the community's resource management system. This leads to the development of the knowledge network of the farmers and lead to the transferring of these knowledge and technologies to the tourists and the interested people. (Mon Mai, Agro-tourism Study the agricultural way, 2005)

Nakhon Pathom is one of Thailand's main tourist destinations. It is province that located on the central-west region of Thailand and in the Tha Chin river basin which is the area of Thailand's central plain region. The size of the area is 2,168,327 square kilometers. It is the 62<sup>nd</sup> largest area of the country and consisted of 7 administrative districts which are Amphoe Mueang Nakhon Pathom district, Don Tum district, Bang Len district, Sam Phran district, Phutthamonthon district

and Kamphaeng Saen district. The occupation of its population are varies. The outstanding occupation is agricultural related occupations. Each district has its own development of their own communities and promoting them as the attraction sites. The communities in Kamphaeng Saen is an example of those communities. Kamphaeng Saen is the area that has uniqueness in the way of life and the natural resources which made each community competing with each other to become an agro-tourism community. (Office of Nakhon Pathom provincial administrative, 2016)

Huai Muang is a community in Kamphaeng Saen district. In the past it has old temples and sacred places that the residents respected. The east side of the temple is a small canal which the villagers used this canal for their agriculture as it's their main occupation made for their living. Since the area are rich in its natural resources and most of them are the fully-grown mango trees. This is the reason why it is called "Huai Muang" to the present. The size of Huai Muang area is about 31.51 square kilometers. The area is a plain with canals cutting through the area made it suitable for the agriculture. As a result, the main occupation of the local population is farming and their supplementary occupation is fishing and animal husbandry. This community also has shrimp farming, growing the organic vegetables and it also has agricultural products that are labelled as one Tambon one product )Rewadee Buapetch 's community enterprises, Nakhon Pathom provincial administrative, 2018(.

The main problem of this community is the lack of abilities in public relation and promoting the tourism business



of the area in their community. This is due to the fact that most of the people in the community are in their middle age and has low knowledge and understanding in the application of the media. Therefore, they cannot clearly determine what is the need of the community in order to make this known, acceptable to the other people and attract people around the world and make them want to truly learn about the agricultural tourism.

As a result, the researcher is interested to studying about the public relation development to promote agro-tourism of the Huai Muang community, Kamphaeng Sean district, Nakhon Pathom province. The result of the research then will be used to develop the public relation media along with the learning and practicing the skills of the farmers who can use it to evaluate the development of their community. This can lead to the agro-tourism community that can respond to the need of all type of tourists as well as becoming a tourist attraction that is accepted and become sustainable for the agricultural tourism business in the future.

### **Research objectives**

1. To study the context of the area of Huai Muang community, Kamphaeng Saen district, Nakhon Pathom.
2. To study the development of public relation media for promoting the agricultural tourist destination of Huai Muang community.

### **Definition of the related terms**

Tourism means travelling from one place to another place to relax, entertainment or to gain new knowledge. The purpose only travel alone not for the occupation or earning the income. Chalongsri Pimolsomphong (1999 : 4)

Agro-tourism means the arrangement of agricultural tour and visiting the place where there is an orchard, the flowers garden which is the tourism that focuses on the process of agriculture and the local farmers way of life. This kind of tourism focuses on participation of tourists in the activities allowing them to learn the agriculture, way of living, culture and tradition and it also brings the existing resources and create the value from those resources by creating the knowledge transferring and lead to the income of the local community. Boonlert Jittungwattana (2005)

Public relation media means the tools or the median that are used to convey the news, story and the information from the organization to the public which can be classified by many different categories. The media type for public relation need to concern about the concrete characteristics that could be potentially developed into beneficial outcome in the future. From the website of public relation

## **II. RELATED IDEAS AND TOURISM THEORIES**

### **1. Concept and tourism theory**

#### **1.1 Tourism factors**

Tourism factors should consist of at least 5 elements or the 5As as follows

- 1.1.1 Accessibility, the access to attractions
- 1.1.2 Attractions, The interest and the focus of

tourism

- 1.1.3 Activities, activities in tourist destination
- 1.1.4 Accommodation, accommodation for tourists

#### **1.1.5 Amenity, facilities**

### **2. Concepts and agricultural tourism theory**

#### **2.1 Elements of agricultural tourism**

Niorn Srisomyong (2552) has explained the three most important elements of agro-tourism which are the agro-tourism resources, tourism market and tourism service providing.

2.1.1 Agro-tourism resources are the resources that used in the production process of the agricultural products. It could be a naturally grown products in the nature or created by the human efforts.

2. 1 2.Tourism market. Due to the fact that agricultural tourism is a specific kind of tourism market hence, the marketing management need to have its own specific characteristic. It must focus on the tourists who are interested in the agricultural activities and what to truly learn about the local culture and tradition

2.1.3 Traveling services. The traveling services of agricultural tourism such as accommodation, restaurants and touring agency services must relate to the local agricultural. A good example is the homestay and farm stay business.

### **3. Idea and public relation theory**

#### **3.1 Type of public relation**

3.1.1 Personal media is a fundamental media for public relation in the situation that needs to distribute the information to the specific group of people who can access to this type of media. Jaruwan Arunlerth (2000 : 79-81)

1. (Spreading words of mouth
2. (Using of presenter
3. (Using of employee

#### **3.1.2 Printing media**

1.) Manual which is a small size handy book and can be took anywhere which printed to guide and provide knowledge about a related topic.

2.) Brochure which is a one-sheet document and can be folded into many forms depends on the design. The page arrangement, images is an important element that will attract people to read it.

3.) Journal is a news distribution that control the content as the publisher want. There any many type of content on the journal such as news, documentary, article, photos

#### **3.1.3 News media**

1.) Newspaper which is an important public relation media and influences people's way of life. Due to the fact that the price of the newspaper is cheap and can access to the large group of the population within a short period of time made its information fresh and update to the current situation. Newspaper is durable can be revised and kept as an evidence.

2.) Radio broadcaster which is a media that influences to the listener because it is a ty

3. (Magazine is a very popular media because it has a sophisticated printing system which is also beautiful, colorful, attractive, interesting and now it even being added more benefits than it used to be.

### III. RESEARCH METHODOLOGY AND APPROACHES

This research applies the qualitative researching approach which has procedure and it can be shown as follows.

**Step 1** The researcher studied the idea, theory and the related researches that contains the secondary information from various sources. The study consisted of steps, document selection and analyzing of those related documents in order to create the interviewing form.

**Steps 2** Interview the participants who involve with the agricultural tourism of Huai Muang community using the in-depth interviewing form from step 1. The involved parties are composed of the local district administration organization and the group of community's leaders such as the community's headman and his assistance, the agricultural enterprise, restaurant and transportation, the residents in the area and the tourists. The topics that are analyzed from the research papers are context of Huai Muang's history, the resources of the area, the tourism passage, the tourism activities and the tourism potential of the area.

**Step 3** Verifying the accuracy of the information and analysis of the content within the scope of the research before concluding, synthesizing to get the information that under the study and the objectives and represent the result in the descriptive manner.

### IV. RESEARCH RESULT

#### 1. Contextual information of Huai Muang community's area, Kamphaeng Saen district, Nakhon Pathom province.

According to the interview of the participants that involved with the Huai Muang agricultural tourism, Kamphaeng Saen district, Nakhon Pathom, it can be concluded that Huai Muang has the area of 31.51 square kilometers. It is an alluvial plain with canals cutting through the area made it suitable for farming and agriculture activities. In the past, there were old temples and sacred places that the villagers respected. The east area of the temple is a small creek which the villagers use it for agriculture for their living. Due to the ample in its natural resources and there are plentiful of the naturally-grown plants and trees and most of them are the mango tress which is the reason why this community is called "Huai Muang" to the present. The unique characteristic of this community is the commercial shrimp breeding pond and the resources in the area. Most of the resources in the area are the natural resources which consisted of agricultural crops, canals, creek and the fruit trees. Beside the natural resources, there are also resources that people in the community have created to use in their daily life which also reflects the development of the community which continuously evolving though generations such as the temple, multi-purpose building and housing. The tourism related resources are consisted of shrimp pond made of cement, Organic vegetable field and banana garden, a courtyard for traditional ceremony, traditional woven cloth, processed food and so many more. These reflect the simple way of life of the people in the community and also clearly reflect the involvement of the community's member with their tourists attracts.

The 5 factors of tourism (5A) of Huai Muang agricultural tourism are shown as follows.

1.1 The accessibility of the tourist attraction. There are many routes that reach to the community and there are also many territories that are connected with Suphanburi province as well as Kanchanaburi. There are many modes of transportation that could get to the area such as the personal car, public van and bus. However, the traffic sign is not clear because most of them are old and broken.

1.2 Tourist attractions are consisted of

- 1.) the community's cultural courtyard
- 2.) agricultural Thai-Lao housewife group
- 3.) Organic vegetable garden
- 4.) Thai-Lao traditional woven clothes
- 5.) Tha Sao women group
- 6.) Uncle wean's garden
- 7.) Commercial shrimp breeding pond
- 8.) Display of new agricultural theory.

1.3 Tourism activities which allow the tourists to participate in the community's activities such as the sigh seeing the atmosphere of the preserved traditional house or the traditional woven clothes that integrated with the unique style of ancient traditions of Thai-Lao ethic group at the cultural courtyard. Not to mention learning about organic vegetable gardening and demonstration the making of Thai-Lao Yuan traditional woven clothes and processing of the products from Tha Sao women group. The other remaining activities are learning how to make a banana garden from Uncle's Wean garden, learn the right way to shrimp fishing from the commercial shrimp ponds and experiencing the new theory of agriculture farming.

1.4 Accommodation in the community is clean and safe but there are not enough number of the accommodation that could response to the need of the large number of tourists due to the unclear direction of management. Therefore, the accommodation only suitable for those who travels with their families or the small group of people.

1.5 The facilities in Huai Muang community are supported for the parking area which is sufficient for the tourists. The bathroom is clean but there are not enough numbers of the bathroom in each attraction sites. There is sufficient restaurant that could serve the tourists. The community also has the vehicle that takes the tourists into each attraction sites which has a good service and sufficient to meet the need of the tourists.

#### 2. A study on the development of the public relation media for promoting Huai Muang community's agricultural tourism

2.1 There are three types of media that are suitable to develop for news and information sharing and distribution which are the personal media, the printing media and the news media.

2.1.1 According to the studies, Huai Muang community has continuously applied the personal media. The popular way is the spreading of the word of mouth and relies on the expert in public relation in promoting its tourist destinations to attract the tourists and the people who interested.

2.1.2 The printing media of Huai Muang community are consisted of the small manual, brochure and leaflet which are

responsible by the related organization. When the promoting and the public relation activities started, the reception from the tourists are low made this kind of promoting not concrete as it should be.

2.1.3 According to the studies, the promoting and the public relation activities via this kind of media of Huai Muang tourism business are done in a small number. At the present, Facebook channel is used to disseminate the information related to the community and the information is shown in the same direction and same perspective. The members of the community don't have the ability and the knowledge about the media. Most of them just use them on their own or learn from the young people.

2.2 The synthesis for the guideline of promoting the tourism of Huai Muang community's agricultural tourism are consisted of 4 categories as shown below

#### 2.2.1 Planning

##### 2.2.1.1 Planning principle

1. The thorough study in all of the aspects of the information must be made as well as the understanding about each type of media. When looking back into the past, the present and the future, what makes the promoting and the public relation changes over time.

2. Consideration of the existing resources such as the human resources, the budget as well as the promoting media needed for promotion and public relation activities.

3. The sufficient human resources is necessary for the promoting media and the public relation activities. The main objective must be driven by the success and the evaluation approach.

##### 2.2.1.2 Planning elements

1. Time

2. Budget

3. Human resources

#### 2.2.2 communication for public relations

##### 2.2.2.1 Elements of communication

1. The source is the person who initiates the communication process which could be done individually or in groups that are the target. The sources need to have the objective in the promoting and public relation.

2. Message is the information, news or the story of the related content that could be shared and distributed in order to promote and spreading the information to the people and understand what the organization would like to communicate.

3. Channel are the information distribution channel of the sources to the receiver. In the context of public relation, channel is the way that the information or the news could be spread to the receiver such as the newspaper, television, radio, magazine, file or the printing media for examples

4. Receiver

##### 2.2.2.2 Objective of communication

1. Objective of the source

1.1 To inform or communicate. In the communication process, the message sender has objective to tell or to inform about the situation or the information that make the receiver understand.

1.2 To teach or to educate in the educational manner in order to transfer the knowledge to the receiver.

1.3 To entertain or to persuade

2. Objective of the source or the message sender

2.1 To study and search for the knowledge for the news that could generate the new knowledge. This is to understand the information in the teaching or the educating of the source or the message sender.

2.2 To gain the entertainment, besides finding the information and the knowledge the recipients want to find the entertainment, relaxation for themselves.

2.3 For action and decision

#### 2.2.3 Human resources

##### 2.2.3.1 Characteristic of the human resource

Good command in communication and public relation. Need to have the interpersonal skill and be able to work with the other people in the same team or the target group. Be able to systematically manage. Need to have the morality in the profession and good at working, good at his work, good at thinking, learning and being a good person.

##### 2.2.3.2 The importance of human resource

1. The duty of public relation is expected from the administration that it could be used as the administration tool. If the public relation is good then it will positively affect every other unit of the organization.

2. The administration and management of promoting and public relation that is managed by those who are not truly understand this kind of work. This could reduce the factor that manager concerns about and allowing them to concentrate with something else.

3. The organization that has employees and the quality of those human resources can be considered as professional can be also inferred that the organization is fortunate in both the context of the result and the reputation of the organization.

4. Professionalism: Having human resources with professionalism will affect the general reputation of those who work in this kind of profession and make the field of profession become accepted and becoming more important continuously overtime.

#### 2.2.4 Evaluation

##### 2.2.4.1 Importance of Evaluation

1. Evaluation of the strategies before conducting them allow the plan manager and those who conducts and execute to trust in the objectives of the process and the components of the plan.

2. Evaluation during the executing the plan or monitoring the result of the work process will acknowledge and allow people to understand performance of the personal in the work process as well as the progress in the implementation of the plan and appropriateness of the resource consumption.

3. The evaluation of the result after the plan has been executed allow people to check the performance of the public relation activities conduction and the level of consistency between the performance of the goal and the defined objectives in the strategies.

##### 2.2.4.2 The principle of evaluation

1. The objectives of the project must be defined. This also include the activities, strategies, procedures,

outcome and the result of the communication and the clear form of acceptable result which will be used as the baseline of the performance evaluation of the public relation conduction.

2. The difference between the output measurement, effect of the communication and the result must be clearly distinguished to be able to measure the effectiveness of the public relation conduction.

3. The effectiveness of the public relation activities should not be evaluated and measured by consider only the component of the public relation but should also measure and evaluate by concerning the relation of the defined factors in the activities' target, objectives, strategies, and the procedures of the organization.

## Result Discussion

The context of Huai Muang community which is an alluvial plain. There are also canals cutting through the area. In the past there were old temples and sacred places that the villagers respected. The east side of this temple is a small creek creek which the villagers use it for agriculture for their living.

Due to the ample in its natural resources and there are plentiful of the naturally-grown plants and trees and most of them are the mango tress which is the reason why this community is called "Huai Muang" to the present.

The unique characteristic of this community is the commercial shrimp breeding pond and the resources in the area. Most of the resources in the area are the natural resources which consisted of agricultural crops, canals, creek and the fruit trees. Beside the natural resources, there are also resources that people in the community have created to use in their daily life which also reflects the development of the community which continuously evolving though generations such as the temple, multi-purpose building and housing. The example of the tourism resources in the area are commercial shrimp pond that made of cement, organic vegetable garden, banana garden, traditional culture, traditional woven clothes, processed food and so many more which reflect the simple way of life of the residents. The people in the community are involved in the tourists attraction which consists with Rewadee Buapetch, Nakhon Pathom agriculture office (2561) said that the tourism business of Huai Muang started in 2560 which is the continuation of "Following our father's footstep" project which its purpose is to develop a sustainable agriculture (9101). This project won the 1<sup>st</sup> prize in the field of fishery. After that, the member of Huai Muang community's agriculture group has a chance to visit the government section at Ban Na Ton Chan, Sukhothai province. We they learned about the tourism management of the community, the members had a chance to have a meeting with local organizations with their purpose to develop their community and turn them into a tourist attraction site. The plan is to provide a tourist route that demonstrating the way of life, traditions and culture integrating with the variety of agriculture activities of Huai Muang community which are Huai Muang temple and the demonstration of Lao-Yuan, Lao-Kung, Lao-Song, Tai and Chinese way of life, traditional woven clothes, farming, organic gardening, farming with new theory of agriculture, shrimp breeding and agriculture processing of farmer groups. This allow the tourists to learn,

to experience the unique way of life of Huai Muang community. In the study of the development of public relation media in order to promote the tourism of Huai Muang community's agriculture tourism, Kamphaeng Saen district, Nakhon Pathom. The analysis of the information revealed that there are 3 types of media that are suitable for distributing the news which are the personal media, printing media and news media. The development guideline for the public relation media for the promotion Huai Muang community's agricultural tourism has 4 aspects 1.) Planning must be defined by the planning principle and the components of planning 1.1) Planning principle which need to study all of the aspects of the information and have the in-depth understanding of each type of media. When considering the available resources such as human resources, budget, equipment and the variety type of media that are used in the promotion and public relation activities which also takes addition budget and time. As a result, before deciding which kind of media to use, it need to be carefully considered in order get the most effective outcome. 1.2) Related planning components such as time, budget and personnel. 2.1) Communication components which are the message sender, message, media and receiver 2.2) Objective of communication fir the message sender in order to inform, to teach, to educate, to provide entertainment and to persuade. In the perspective of receiver, to know, to study, to gain the entertainment and to act and make the decision 3.) Human resource 3.1) Personnel characteristics are consisted of knowledge and ability to work in the field of public relation. Being able to work with other people and have the interpersonal skills and able to work as a team or with the other parties and being able to manage or systematically manage the work. 3.2) The importance of personnel is the personnel themselves in term of management, the organization and the professions. 4.) Evaluation: the performance evaluation of the public relation personnel which is the process that is related and relevant to all of the activities, all of the procedures in the public relation. It is often also the beginning of the next public relations activities.

## Research Recommendation

### 1. Research recommendation and application

1.1 The result of the research is shown that Huai Muang community has sufficient tourism resources which could be used to promote through online media in order to attract the attention of the tourists from all over the world.

1.2 The result of the research has shown that the accessibility of the traffic signs and accommodation sign and the facilities to support the tourism is not enough to support the large group of tourists. As a result, it should be managed to improve the tourist attraction sites more effectively.

### 2. Research recommendation for next study

For the next study, there should be a research on the development guideline for an internal management to promote the tourism and reputation of Huai Muang community.

## V. CONCLUSION

According to the study of the development guideline for the public relation media to promote Huai Muang community's agricultural tourism, Kamphaeng Saen district, Nakhon Pathom, the problem is the lack of skills in media,

public relation and the ability to promote tourism within their own community. Due to the fact that most of the people in the community are the middle age group including the elderly. Hence, they have low knowledge and understanding of the application of media. Therefore, it cannot be determined that the community is specifically suitable with any kind of promoting media. The studying development of public relation media to promote the tourism in the community focus on the context of the area, the potential resources of the area, the identity and uniqueness and the existing public relation media of the community. All of the 4 guidelines for media development which are the planning, the communication, the human resources and the evaluation are very helpful to promote the agricultural tourism of Huai Muang community. It also allow people to know the right media type for their community to improve their tourism effectively

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## An approach for The quality development of historical sites in Wat Phra Pathom Chedi Ratcha Wora Maha Wihan, Muang District, Nakhon Pathom Province

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### Abstract

This research aimed 1) to study the quality of historical tourism in Wat Phra Pathom Chedi Ratcha Wora Maha Wihan, Muang district, Nakhon Pathom province and 2) to develop an approach for the quality development of historical sites in Wat Phra Pathom Chedi Ratcha Wora Maha Wihan, Muang district, Nakhon Pathom province. Qualitative research was used for the study and data was collected from documents and in-depth interview of people responsible for historical tourism in Wat Phra Pathom Chedi Ratcha Wora Maha Wihan. In total 49 people were interviewed. They included representatives from the government sector, tour operator, community members, and Thai tourists. Data analysis was carried out based on the point of study and was followed by data synthesis.

The results of the study found that 1) the quality of the historical sites in Wat Phra Pathom Chedi Ratcha Wora Maha Wihan were at the highest level. Attraction that achieve this level must have historical uniqueness, magnificent arts, and reputation. In addition to this they must have the capability to support tourists, good facilities, easy access and good management of interesting tourism activities. In Wat Phra Pathom Chedi these are most likely concerned with Buddhism activities. 2) The approach that were produced for the quality development of historical sites in Wat Phra Pathom Chedi Ratcha Wora Maha Wihan were comprised of the following. Firstly, tourism resources and infrastructure should be developed to allow tourists to learn about the historical value of Wat Phra Pathom Chedi Ratcha Wora Maha Wihan. Secondly, marketing, services, public relations and advertisements should be developed. Thirdly, education and personnel responsible for tourism should be trained to give them more knowledge and understanding about historical tourism. Finally, stakeholder participation should be developed to enable all sectors to participate and help enhance historical value of Wat Phra Pathom Chedi Ratcha Wora Maha Wihan accordingly.

**Keywords:** historical tourism/quality of historical sites/quality development

### 1. INTRODUCTION

Tourism is a big and important industry for economy, society, and environment. Tourism industry consists of many businesses such as accommodation business, transportation business, food business, and tour guide business. The merit of tourism industry belongs to the country in which it creates many new jobs as well as circulating the economy and creates income for that country (Chantouch Wannathanom, 2009) as mentioned by

Kasikorn Research Center (2018) in the summarization of the tourism of Thai Teaw Thai in the first half of 2018 that the tourism value of Thai Teaw Thai is around 515,000 million baht, which has grown about 5.4% comparing to the same period in the last year and there is about 74.8 million people travelling in Thailand.

Thai tourism is growing by historical tourism that has been popular in the first half of year 2018 which was the result of historical TV drama that made Thai people interest in visiting historic sites and learn more about history. Tourism

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Authority of Thailand had collaborated with Ministry of Culture and encourage Thai traditional clothes wearing activity in historical sites, making historical tourism and Thai culture grow further as well as encourage historical tourism especially in the shooting location of the drama, which covered 5 provinces including Kanchanaburi, Sara Buri, Phra Nakhon Sri Ayutthaya, Samut Prakan, and Lopburi. Other than the mentioned provinces, Thailand still has many interesting historical sites appeared as secondary scene such as Lampang, Lamphoon, Nan, Phrae, Phetchabun, Phitsanulok, and Nakhon Pathom (Prachachat Business, 2018).

Nakhon Pathom is located in the lower Central Region around Tha Chin river basin and is in the perimeter of Bangkok. From the historical evidence that said "Nakhon Pathom used to be located beside the sea, it is an ancient town, prosperous since Suvarnabhumi and is the important capital in Tarawadee period" (Suphaluck Ampanwong, 1999), it

appeared that Nakhon Pathom is an ancient and important town with long history. There are many historical tourism sites appeared in Nakhon Pathom with the arts of Tarawadee all the way to the current arts in both archeological sites and antiquities such as Sanam Chan Palace, National Museum Phra Pathom Chedi, Wat Phra Tone Chedi Wora Wihan, Wat Phra Ngam, and Wat Phra Pathom Chedi Ratcha Wora Maha Wihan.

Wat Phra Pathom Chedi Ratcha Wora Maha Wihan is a prominent tourism site situated in the heart of Nakhon Pathom, it is an important sanctuary that unites the heart of townspeople and tourists and acting like a representative of Tarawadee and Rattanakosin histories. Wat Phra Pathom Chedi Ratcha Wora Maha Wihan has an important historical value for Thailand as it stood tall in the heart of Nakhon Pathom, it is an important sanctuary that unites the heart of townspeople and tourists and acting like a representative of Tarawadee and Rattanakosin histories. Wat Phra Pathom Chedi Ratcha Wora Maha Wihan is a historical tourism site that attracts people because this temple has an important historical value for Thailand by showing the archeological evidences contains arts, cultures, and environment. In the ability to support tourists, Wat Phra Pathom Chedi Ratcha Wora Maha Wihan has many basic tourism facilities such as restaurants, public utilities, and tour guides. In the ability to manage, Wat Phra Pathom Chedi Ratcha Wora Maha Wihan managed the usage of area to be suitable with every parts. There are also supervisors from the government, community, and managers in the area as well (Nakhon Pathom Office, 2018).

From the survey, the researchers noticed the problems of Wat Phra Pathom Chedi Ratcha Wora Maha Wihan, which are the quality of place as some tourists did not understand and learn anything from the temple while the temple did not seriously collaborate with each other as well. Wat Phra Pathom Chedi Ratcha Wora Maha Wihan is an important archeological tourism place but there are problems from security that could not cover well such as the condition of the shops and unorganized parking that obstruct other people. Therefore, the researchers decided to study in approach for the Quality Development of Historical Sites in Wat Phra Pathom Chedi Ratcha Wora Maha Wihan, Muang District, Nakhon Pathom Province.

## II. OBJECTIVES

1.To study the quality of historical tourism in Wat Phra Pathom Chedi Ratcha Wora Maha Wihan, Muang district, Nakhon Pathom province.

2.To be an approach for the quality development of historical sites in Wat Phra Pathom Chedi Ratcha Wora Maha Wihan, Muang district, Nakhon Pathom province.

## III. EXPECTED BENEFITS

1.Basic information of the quality of historical tourism site: Wat Phra Pathom Chedi Ratcha Wora Maha Wihan would be obtained in terms of potential to attract tourism, potential support tourism, and potential to manage the site.

2.The findings of the performance of historical tourism site Wat Phra Pathom Chedi Ratcha Wora Maha Wihan would

be applied as a guideline for improve the quality of historical tourism sites.

## IV. RELATED CONCEPTS

1.Components of sustainable tourism development; Warunyu Wiengamphol (2005) said that components of sustainable tourism development included 4 major aspects 1) management of tourism resources and infrastructure, 2) management of marketing, services, public relations and advertisement, 3) educational management and development of personnel responsible for tourism, 4) management of stakeholder participation.

2. Historical tourism, Department of Tourism (2014), Thipaporn Tribun, (2014) said that historical tourism referred to travelling to tourist sites having historical importance to admire and gain knowledge and understanding about stories in those places and realize value and importance of history in good conscience so as to preserve cultural value with participation of people in communities to get involved with tourism management.

3. Quality of historical sites; Department of Tourism (2014) said that quality of historical sites with historical site standards comprised 1) capability to attract tourists, 2) capability to support tourism, 3) tourism management and participation of local communities.

## V. RELATED RESEARCH STUDIES

Suthasinee Wiyaporn (2016) conducted a study about development of historical site: Prasat Sdok Kok Thom in Sa Kaeo province. The objectives of the research are 1) to study current status and evaluate historical sites with quality standard evaluation form of Office of Tourism Development, Ministry of Tourism and Sports as an instrument to collect data, 2) to offer an approach for sustainable tourism development with local administration office and local people. Group discussion was used as a research instrument. Research results can be concluded as follow: (1) current status of Prasat Sdok Kok Thom is counted as the biggest ancient remains of East Thailand. It has been restored to its original splendor but not yet completed under the supervision of the Fine Arts Department 5, Prachin Buri province. It has unique and stunning architectural features, a pond surrounding the area and it is cool and shady with the highest level of tourism management, (2) the development of Prasat Sdok Kok Thom has been supervised by the Fine Arts Department 5, Prachin Buri province and communities are able to participate in developing the areas surrounding the Prasat by enhancing public relations of tourism sites.

Prapawee Wongbutsri (2013) conducted a research study about quality development of historical tourism in the north eastern region of Thailand. The objectives of the study are 1) to determine a pattern of quality development of historical tourism in the north eastern region for Thai tourists, 2) to study personal factors of tourists that have effect on satisfaction with marketing mix and logistics management of historical sites, 3) to study marketing mix factors and logistics management of historical sites that have effect on the return of tourists, 4) to seek an approach for increasing capability in supporting tourists of historical tourism with good quality

during a high season. Study results indicated that tourists had satisfaction with marketing mix and logistics management of historical sites at a high degree. It was found that tourists having different personal factors had satisfaction with marketing mix and logistics management of historical sites differently. Moreover, it indicated that tourists most likely returned to pay a visit based on factors about products of historical sites. With regards to approach in increasing capability to support tourists, in general there should be development and improvement about services and logistics management in different aspects such as controlling price of products, establishment of information center and supporting people in communities to have income from selling products to tourists, and supporting people in communities to understand and participate in building local uniqueness.

## VI. RESEARCH METHODOLOGY

This research depended on qualitative methods with 3 steps as follow:

**Step 1:** conduct a survey research at the study area; Wat Phra Pathom Chedi Ratcha Wora Maha Wihan, to obtain physical, sociocultural data of the area and related research about quality development of historical sites and create in-depth interviewing forms;

1.1 The researcher studied related documents, concepts, theories and research studies of secondary data from various sources. The study comprised gathering documents, sorting documents, and analyzing documents to use in creating in-depth interviewing forms.

1.2 The researcher presented the in-depth interviewing forms to instructors who were associated with survey and research of tourism industry. All of them were Dr. Nipon Chuemuangpan, Dr. Prapon Leksuma, as well as the research advisor; Dr. Wongrawit Nomnumsub, and other experts to check validity in terms of the structure of questions, language and style, comprehensiveness of contents, and advices provided for improvement of the interviewing forms to gain more completeness.

**Step 2:** Checking the in-depth interviewing forms and in-depth interview with persons associated with historical tourism in Wat Phra Pathom Chedi Ratcha Wora Maha Wihan;

2.1 the interviewing forms from the step 1.2 were used to do in-depth interview with persons associated with historical tourism in Wat Phra Pathom Chedi Ratcha Wora Maha Wihan, Muang district, Nakhon Pathom province such as government sector, private sector, communities, and tourists; totally 49 persons. Target groups were selected with purposive sampling; government sector included Mayor of Nakhon Pathom City Municipality or representatives of Office of Municipality; 2 persons, Director or representative of National Office of Buddhism, Nakhon Pathom province; 2 persons, representatives from Nakhon Pathom Cultural Office; 2 persons, Director or representative from Nakhon Pathom Tourism and Sports Office; 2 persons. All of them were 8 persons.; private sector included restaurants and beverage shops; 4 persons, souvenir shops; 4 persons, accommodation operators; 2 persons, bus operators; 2 persons. All of them

were 12 persons, communities, monks or monk's attendants of Wat Phra Pathom Chedi Ratcha Wora Maha Wihan; 3 persons, Teachers from Wat Pra Phathom Chedi School; 2 persons, villagers living around the areas of Wat Phra Pathom Chedi Ratcha Wora Maha Wihan ; 8 persons. All of them were 13 persons. Accidental sampling was used to determine the sample size of 16 tourists.

**Step 3:** Data from the interview of the expert group were analyzed according to quality standards of historical sites. The analysis was made in accordance with components introduced by the ministerial criteria of Department of Tourism and Sports which comprise 3 aspects as 1. Capability to attract tourism. 2. Capability to support tourism. 3. Tourism site management.

Data analysis results were summarized and discussed to be adopted as an approach for the quality development of historical sites in Wat Phra Pathom Chedi Ratcha Wora Maha Wihan, Muang district, Nakhon Pathom province.

## VII. RESULTS

An approach for the quality development of historical sites in Wat Phra Pathom Chedi Ratcha Wora Maha Wihan, Muang District, Nakhon Pathom Province can be discussed as follows.

**1) To investigate the quality development of historical sites in Wat Phra Pathom Chedi Ratcha Wora Maha Wihan, Muang District, Nakhon Pathom Province Within the context of the area where Pra Pathom Chedi Ratcha Wora Maha Wihan is located.**

Pra Pathom Chedi Ratcha Wora Maha Wihan, Muang District, Nakhon Pathom Province is the first Chedi, a Buddhist stupa, located in Suvarnabhumi region and expands as the largest in Thailand. Embraced in the history of Buddhist Prosperity during the reign of King Asoka Maharaj sending his royal diplomats for spreading their religion in Thailand. Initially, it was constructed in an upturned bell or so-called sanchi stupa originated in India. Later in 1853, Phra Bat Somdet Phra Poramenthra Maha Mongkut Phra Chom Klao Chao Yu Hua, or Rama IV ordered to reconstruct the new Chedi surrounding the previous one standing at 120 m. and 45 cm. as well as the adjoining cloister. After the passing of King Rama IV, Somdet Phra Paramindr Maha Chulalongkorn or Rama V successfully restored the bell tower decorated with golden tiles. Until the reign of King Rama VI, the northern Chedi was reconstructed to enshrine Phra Ruang Rojanarit Sri Indraditya Dhammobhas Mahavajiravudhraj Pujaneeya Bophitr, in Bangkok, that was found in completely deteriorating condition in an ancient temple in Si Satchanalai. Once his accession to the throne, the ceremony of gold pouring shaped the standing Buddha image with the attitude of persuading the relatives not to quarrel to be enshrined in the northern tower. The King expressed his will of burying his own ashes beneath the image. Upon the death of King Rama VI, Prajadhipok or Rama VII conducted the royal ceremony where the deceased preceding King VI's ashes was buried beneath Phra Ruang Rojanarit.

Pra Pathom Chedi Ratcha Wora Maha Wihan is outstanding for sky-touching height and largest-sized stupa in



Natural Resources	Historical Site and Religious Resources	Activities
<p><b>Historical religious tree</b> (essential in Buddhism)</p> <ul style="list-style-type: none"> <li>-Pink Shower</li> <li>-Jambolan</li> <li>-Bamyan</li> <li>-Fish Poison</li> <li>-Palu</li> <li>-Bodhi</li> </ul> <p><b>The Tree of King Rama IV's pilgrimage</b></p> <ul style="list-style-type: none"> <li>- Water Tube</li> </ul> <p><b>The Tree planted by King Rama IX</b></p> <ul style="list-style-type: none"> <li>- Golden Shower</li> </ul>	<p><b>-Pra Pathom Chedi</b></p> <p><b>North</b></p> <p><b>-Wihan of Birth (The northern wihan)</b></p> <ul style="list-style-type: none"> <li>- Phra Ruang Rojanarit</li> <li>- King Rama Vi cremated ashes</li> </ul> <p><b>-Northern slope</b></p> <ul style="list-style-type: none"> <li>- The Buddha image with the attitude of Nirvana</li> <li>- Pra Uttara Thera and Pra Son Thera</li> </ul> <p><b>The East</b></p> <p><b>- Wihan of Enlightenment (Wihan Luang)</b></p> <ul style="list-style-type: none"> <li>- Pra Borom Sarira (imitated)</li> <li>- The Sihing Buddha image (imitated)</li> <li>- Wall painting at the Wihan Luang</li> <li>- Phuttha Maha Vajira Maravichai Buddha image</li> </ul> <p><b>-Eastern slope</b></p> <ul style="list-style-type: none"> <li>- Luang Ubosok</li> <li>- Standing Buddha image</li> <li>- Ye Dhammar Script</li> </ul> <p><b>- Phlab Phla Pleuang Khreuang</b></p> <p><b>- Huernia</b></p> <p><b>-Museum of Pra Pathom Chedi</b></p> <ul style="list-style-type: none"> <li>-Historical evidence in Dvaravati era</li> <li>- Buddha image with sandalwood</li> <li>- Yalae's Tomb</li> </ul> <p><b>The South</b></p> <ul style="list-style-type: none"> <li>-Wihan of Sermon (the Southern Wihan)</li> <li>-Buddha Sheltered by Naga Hood</li> <li>-The Buddha image with attitude of instructing 5 Panjavadi</li> <li>-Wall painting</li> <li>-Bronze statue in King Rama IV</li> <li>-Southern slope f. Khao Pra Sila Luang Poh</li> <li>-Chedi simulation of Pra Maha Taj and Chedi simulation of 2 Buddha images.</li> </ul> <p><b>The West</b></p> <ul style="list-style-type: none"> <li>- Reclining Buddha Image]</li> </ul>	<p><b>-Religious Activities</b></p> <ul style="list-style-type: none"> <li>-Making merit</li> <li>-Praying Images</li> <li>-Ordainment</li> <li>-Importantly Religious days</li> </ul> <p><b>-Historical site visit activities</b></p> <ul style="list-style-type: none"> <li>-Learning origin historical site, Pra Pathom Chedi Ratcha Wora Maha Wihan</li> </ul>

Thailand. It was influenced by Lanka's upturned bell shaped integrated with Sukhothai arts decorated with gold around the stupa. Wihan located in 4 different directions encircled the Chedi, called as "Sang Wechanee Satarn", is a place to reminisce Lord Buddha encouraging and inspiring people to feel calm and continue making good deeds. Sang Wechanee Satarn in the Pra Pathom Chedi Ratcha Wora Maha Wihan stands in 4 different locations:

Wihan of Birth at the north where Phra Ruang Rojanarit is located.

Wihan of Enlightenment located at the east side where the Sihing Buddha image is situated.

Wihan of Sermon at the south housed the Buddha image with attitude of instructing 5 Panjavadi. Last one, Wihan of

Nirvana is located in the west enshrining with the Buddha image with the attitude of Nirvana.

The identity held inside the Pra Pathom Chedi Ratcha Wora Maha Wihan was its containing Sarira of Lord Buddha. Additionally, the whole body of the Chedi were renovated for thrice by different era. In the first era, it was built according to Sanchi style of Ancient India during the reign of King Asoka Maharaj; whereas, more additional construction was added in the second time turning out to be Ancient Khmer influenced in the early Ayutthaya. Finally, in the third time, the Chedi was then renovated to appear in an upturned bell influenced by Lanka, Sukhothai art

Tourism resources in Pra Pathom Chedi Ratcha Wora Maha Wihan can be divided into 2 types 1) natural resource and 2) historical site and religious resources

Based on the study – interview and evaluation of the target group related to the quality development of historical sites, Pra Pathom Chedi Ratcha Wora Maha Wihan, Muang District, Nakhon Prathom, the quality development of historical sites consisted of 3 potentials: tourist attracting potential, tourism capacity potential, tourism management, and communal participation that can be analyzed as follows.

### **1) Tourist Attracting Potential**

#### **1.1 Historical value**

Pra Pathom Chedi is the ancient stupa purported by the archaeologist to be established since the era of Suvannaphumi. Influenced by King Asoka the Great of Ancient India, he sent royal diplomats and sarira to spread Buddhism around the land of Suvannaphumi or presently Nakhon Pathom Province. Therefore, the first stupa, Pra Pathom Chedi Ratcha Wora Maha Wihan, was built in Sanchi style in a similar way with Ancient India. At that time, this area was assumed as a port city due to discovered evidence – numerous shell fossils and ancient sail fossils in Nakorn Pathom Province. Inside Pra Pathom Chedi Ratcha Wora Maha Wihan, the museum is located to collect historical evidence and historical remains in vicinity of the temple such as Dvaravati Buddha image, significantly religious trees, and Pra Pathom Chedi expanding at the largest stupa in Thailand with the national historical value as registered by Fine Arts Department. The identity of Wat Pra Chedi can be seen in various temples; however, Pra Pathom Chedi Ratcha Wora Maha Wihan is the ultimate origin to every chedi in various places. Pra Pathom Chedi Ratcha Wora Maha Wihan is enriched in perfection of architecture and arts thanks to its three-time restoration from different eras. Since then, its renovation goes on.

#### **1.2 Physical Potential and Tourism Management**

Pra Pathom Chedi Ratcha Wora Maha Wihan is found to be easily accessible by foot, personal cars, or public transports. Four-direction entrance and exit welcome all visitors with visible signboard. Now, GPS can be tracked to reach there with security guards hired by the temple to ensure safety of the tourist places and tourists all the time. Various interesting tourism activities that attracts numerous tourists are, for example, yearly festivals, religious days, and business trip for the tour group. The diversity of the activities is held regularly to keep tourists interested.

### **2) Tourism Capacity Potential**

From the interview and evaluation of the tourist place, Wora Maha Wihan provides various accommodations facilitating Thai and international tourists such as tourist service that facilitates tourists or when they have problems, housing for morality camp and Buddhism learning activities, refreshment store, free parking lot, seating area for tourist

during break or waiting, clean and numerous restrooms guaranteed by the Ministry of Public Health. Hence, the temple has the number one renowned restroom.

### **3) Management**

#### **3.1. Tourism Conservation Management**

There 3 factors for tourism conservation management: 1) Pra Pathom Chedi Ratcha Wora Maha Wihan is very well-organized and well-conserved thanks to officers from Fine Arts Department in charge of maintaining. In case of damage, Fine Arts Department will promptly handle it. 2) Area utilization management for Pra Pathom Chedi Ratcha Wora Maha Wihan designates each area for the tourism activities clearly in a good ratio such as refreshment stores located behind the internal glass wall. Pra Pathom Chedi Ratcha Wora Maha Wihan has opening and closing hours ranging from 05.00 – 20.00. The number of tourists is unlimited as Pra Pathom Chedi Ratcha Wora Maha Wihan always welcome every visitor. 3) Nakorn Pathom tourism officers in charge of the tourism activities in Pra Pathom Chedi Ratcha Wora Maha Wihan managed Follow-up and change evaluation such as tourism promotion in Pra Pathom Chedi Ratcha Wora Maha Wihan.

#### **3.2 Tourism Management**

Tourism management in Pra Pathom Chedi Ratcha Wora Maha Wihan consists of 3 factors. 1) Tourist service and hygiene management is conducted by sufficient tourism officers taking care of tourists. The services concern tight security in Pra Pathom Chedi Ratcha Wora Maha Wihan with installation of CCTV. Tourism policemen keep an eye on both Thai and international tourists. There are 8 Security guards in which 4 for morning shift and other 4 for night shift to maintain safety of this tourism place for tourists all along. The refreshment service providing food and drinks that is ensured to suffice tourists. 2) Tourism activity management in Pra Pathom Chedi Ratcha Wora Maha Wihan focuses on religious activities such as making a merit, praying monks, and Buddhist holiday activities. For historical activity, Pra Pathom Chedi Ratcha Wora Maha Wihan must be contacted to prepare a lecturer who can share new knowledge. 3) Knowledge and awareness management found that problems of the tourist service at the north of Pra Pathom Chedi had tourists failed to understand the information about the background despite having the informative signboard. Also, there was no information about the tourism place to tourists as well as whole community.

#### **3.3 Local Community Participation**

There are 2 factors in participation of local community in Wat Phra Pathom Chedi Ratcha Wora Maha Wihan. 1) For the local community participation in tourism place management, the community did not participate in managing the tourism place based on the interview. It mainly

ran by Fine Arts Department in order manage the area of Wat Phra Pathom Chedi Ratcha Wora Maha Wihan. 2) Income from tourism, the community earned income from selling refreshment and souvenirs from tourists resulting in that tourism benefitted the neighboring community.

2) to establish the approach for developing historical attractions in Wat Phra Pathom Chedi Ratcha Wora Maha Wihan, Mueang District, Nakhon Pathom Province.

The findings could be used to synthesize four an approach for developing historical attractions in Wat Phra Pathom Chedi Ratcha Wora Maha Wihan, Mueang District, Nakhon Pathom Province including Development of service marketing, public relations and advertising, Development of tourism resources and infrastructure, Development of education and tourism personnel, and Development of stakeholders' participation as shown in Figure 1.

1. Resource management of the tourism place and its basic structure had tourism resource developing features based on the conditions of the area as priority. It also focused on basic fundamental development suitable for Wat Phra Pathom Chedi Ratcha Wora Maha Wihan, Muang District, Nakorn Pathom Province. It can be subtyped into 2: Tourism place resources and basic structure.



Development of service marketing, public relations and advertising	Development of tourism resources and infrastructure	Development of education and tourism personnel	Development of stakeholders' participation
An approach for developing historical attractions in Wat Phra Pathom Chedi Ratcha Wora Maha Wihan, Mueang District, Nakhon Pathom Province.			

Fig 1. The model of quality development of historical tourism sites in Wat Phra Pathom Chedi Ratcha Wora Maha Wihan, Muang District, Nakorn Pathom Province.

### 1.1 Tourism Place resources

From the study, Wat Phra Pathom Chedi Ratcha Wora Maha Wihan contained cultural and historical resources important to the nation. However, tourists did not learn and understand the importance of Wat Phra Pathom Chedi Ratcha Wora Maha Wihan. Therefore, Wat Phra Pathom Chedi Ratcha Wora Maha Wihan must develop a signboard telling the background and the important spot inside in order for tourists to learn and understand the history of Wat Phra Pathom Chedi Ratcha Wora Maha Wihan.

As Wat Phra Pathom Chedi Ratcha Wora Maha Wihan did not limit the area of tourism activities to tourists that resulted in complete area accessibility for them. However, this may deteriorate the conditions of historical and art values of Pra Phathom Chedi from their behaviors. Hence, Wat Phra Pathom Chedi Ratcha Wora Maha Wihan must arrange warning signs and obligatory signs to inform them of regulation and warning in the area containing archaeological evident artworks to protect them from untimely deterioration.

### 1.2 Basic Structure

From the study, Wat Phra Pathom Chedi Ratcha Wora Maha Wihan did not have wheelchair ramp for physically disabled people and elderly; the group of these people could not engage in tourism activities in Wat Phra Pathom Chedi Ratcha Wora Maha Wihan conveniently. Therefore, Wat Phra Pathom Chedi Ratcha Wora Maha Wihan must include wheelchair ramp designated for physically disabled people and elderly inside to facilitate their tourism activities.

**1.2 Development of Marketing, Service, Public Relation, and Advertisement** is to not let any tourism related consumption damage environment. Marketing and service development must promote and drive every department to cooperate. Therefore, marketing and service must be collaborated and harmonized in full measure. This should be developed as follows.

From the study, Wat Phra Pathom Chedi Ratcha Wora Maha Wihan's public relation focused on toward religious tourism as compared with historical tourism. Many tourists had opposing impression from the actual tourism place. Therefore, Wat Phra Pathom Chedi Ratcha Wora Maha Wihan must have developing guideline to create public relation promoting clearer image of the historical site, Wat Phra Pathom Chedi Ratcha Wora Maha Wihan.

**1.3 Learning and tourism human resource development means ability to utilize** natural resources to the uttermost benefit and the most suitable environment or ability to seek additional knowledge and share it to tourists. Any relevant party must participate in developing every staff member for sustainable tourism. The development guideline must be followed.

From the study, tourism staff members or officers in Wat Phra Pathom Chedi Ratcha Wora Maha Wihan lacked knowledge and understanding about tourism places that could

not answer and share stories of the place to curious tourists. Therefore, Wat Phra Pathom Chedi Ratcha Wora Maha Wihan must a guideline to develop those officers to be knowledgeable and understand the history of Wat Phra Pathom Chedi Ratcha Wora Maha Wihan in which they could learn and understand before properly sharing it to tourist.

**1.4 Development of Stakeholder Participation** means an activity building relationship among 4 groups of people – public sector, tourism entrepreneurs, the community, and tourists. The development measure can be conducted as follows.

From the study, stakeholders of Wat Phra Pathom Chedi Ratcha Wora Maha Wihan warmly participated in various events such annual festivals. The public sector facilitated the parking lot area for tourists in Pra Phathom School. Also, business entrepreneurs set up their stalls selling products inside the festival attracting many tourists to shop as their wishes. The community took their turn among the residents to sell incenses, candles, flowers to tourists for praying. Many of them visited the annual festival. Therefore, Wat Phra Pathom Chedi Ratcha Wora Maha Wihan must have a guideline to develop tourism activities with participation from all groups with Wat Phra Pathom Chedi Ratcha Wora Maha Wihan itself, for example, performance shows of the history of Wat Phra Pathom Chedi Ratcha Wora Maha Wihan. Besides cooperation from all groups, the activity must promote historical value of Wat Phra Pathom Chedi Ratcha Wora Maha Wihan.

## VIII. Discussion

From the interviews and evaluation of the target group related to the quality of the historical tourism of Wat Phra Pathom Chedi Ratcha Wora Maha Wihan, Muang District, Nakorn Pathom Province were applied as the guideline for the quality development of the historical site of Wat Phra Pathom Chedi Ratcha Wora Maha Wihan, Muang District, Nakorn Pathom Province. The quality of historical site served a main key for tourism's decision by 3 factors of the quality standard of historical site of Wat Phra Pathom Chedi Ratcha Wora Maha Wihan: tourist attracting potential and tourism capacity potential, tourism management, and communal participation. According to Department of Tourism (2014), qualitative standard of history of the tourism places consisted of 3 factors: tourist attracting potential and tourism capacity potential, tourism management, and communal participation. From the investigation of the quality of the historical site of Wat Phra Pathom Chedi Ratcha Wora Maha Wihan, the standard of the quality of the historical site of Wat Phra Pathom Chedi Ratcha Wora Maha Wihan in the aspect of tourist attracting potential was in excellent level in the suitable context and historical value. In addition, the activities raise tourists' love and faith in the unique identity of Wat Phra Pathom Chedi Ratcha Wora Maha Wihan. According to Yanatorn Teanthaworn (2016), the case study in Ayutthaya Historical Park the quality of the historical site of Wat Phra Pathom Chedi Ratcha Wora Maha Wihan of Thai and international tourists had overall excellent level of tourist attracting potential due to its historical

uniqueness and archaeological beauty that is reputation and well-accepted by tourists. Thanks to this, it led to the guideline in developing the quality of Wat Phra Pathom Chedi Ratcha Wora Maha Wihan, Muang District, Nakorn Pathom Province. From the data analysis, the guideline of the quality development of Wat Phra Pathom Chedi Ratcha Wora Maha Wihan, Muang District, Nakorn Pathom Province can be divided into 4 main factors: tourism resource management and basic structure, management of marketing, service, public relation and advertisement, education and tourism human resource management, and stakeholder management. According to Waranyu Wingumpol (2005), there are 4 factors of sustainable tourism development. 1) tourism resource management and basic structure, 2) management of marketing, service, public relation and advertisement, 3) education and tourism human resource management, and 4) stakeholder management. Therefore, the guideline for the quality of the historical site of Wat Phra Pathom Chedi Ratcha Wora Maha Wihan showed that learning and tourism staff development measure is the most important; for example, tourism staff or officers at Wat Phra Pathom Chedi Ratcha Wora Maha Wihan lacked knowledge and understanding of this tourism place and were unable to answer curiosity of tourists. Training must be held to improve their knowledge and ability about historical site of Wat Phra Pathom Chedi Ratcha Wora Maha Wihan. Followed by another thing needed for development, tourism place resource management and basic structure were, for example, cultural and historical resources and signboard depicting historical background and important spots around Wat Phra Pathom Chedi Ratcha Wora Maha Wihan. As a result, tourists might learn and understand the historical value of Wat Phra Pathom Chedi Ratcha Wora Maha Wihan. For development of marketing, service, public relation, and advertisement, media must be created to publicize and promote the history of Wat Phra Pathom Chedi Ratcha Wora Maha Wihan in order to build clearer image of the historical site of Wat Phra Pathom Chedi Ratcha Wora Maha Wihan. Stakeholder participation development must focus, for example, tourism activity promote from participation from all groups of people e.g. historical performance about Wat Phra Pathom Chedi Ratcha Wora Maha Wihan. Besides the activities cooperated by all groups, the activity could promote historical value of Wat Phra Pathom Chedi Ratcha Wora Maha Wihan. According to Thanatwan Kunsri and Sathaporn Mongkolsrisawat (2015), rapidly growing tourism could impact economic change, socio-cultural aspects, and tourism environment. It raised the community to understand and be aware of tourism management and resource and environment conservation sustainably.

## IX. SUGGESTIONS

### 1. Suggestions for implications

1.1 From the result, Wat Phra Pathom Chedi Ratcha Wora Maha Wihan holds the nation's historical importance that must initially be developed by creating a board narrating historical background and important spots in Wat Phra Pathom

Chedi Ratcha Wora Maha Wihan for tourists to understand its historical value.

1.2. From the result, officers working in Wat Phra Pathom Chedi Ratcha Wora Maha Wihan must design any activities to be suitable for most tourists entering the historical site of Wat Phra Pathom Chedi Ratcha Wora Maha Wihan coming as a family, or in educational trip group, and international tourist group.

## 2. Suggestions for Further Study

For suggestion for further study, tourism activity must be developed as a guideline such as historical show of Wat Phra Pathom Chedi Ratcha Wora Maha Wihan to raise tourists' awareness and realization of its history.

## X. CONCLUSION

From the investigation of the approach for the quality development of historical sites in Wat Phra Pathom Chedi Ratcha Wora Maha Wihan, Muang District, Nakhon Pathom Province, the main problem involved that tourists did not learn anything from visiting Wat Phra Pathom Chedi Ratcha Wora Maha Wihan considered as a significant historical tourism activity. The approach for the quality development of historical sites in Wat Phra Pathom Chedi Ratcha Wora Maha Wihan, Muang District, Nakhon Pathom Province emphasized knowledge and understanding of tourists of Wat Phra Pathom Chedi Ratcha Wora Maha Wihan as well as the guideline for historical tourism promoted by raising historical awareness in order to for the tourism place to stand out in the region with ability to meet the needs of tourists.

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# The guideline of elderly tourist guides curriculum development for Koh Lad E-Tan subdistrict, Nakhon Pathom province

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## Abstract

The objective of this research was to study the guideline of the elderly tourist guide curriculum development for Koh Lad E-tan district, Nakhon Pathom which consisted of 4 steps as follow; 1) the study of fundamental data for the curriculum's development, 2) the construction of the training curriculum, 3) the implementation of the training curriculum and 4) the evaluation of the training curriculum.

The instrument utilized included 1) the questionnaire and interview form for the stage of fundamental data gathering, 2) the training curriculum evaluation form, 3) the training curriculum for the elderly tourist guide in Koh Lad E-tan district, Nakhon Pathom, 4) the questionnaires of the participants involved the training curriculum.

The samples were a group of 30 local residents in Koh Lad E-tan district, Nakhon Pathom province. The data were analyzed by percentages (%), mean (X), standard deviation (S.D.) and content analysis.

The research found that the participants wished to continue the course of the elderly tourist guide curriculum development for Koh Lad E-tan district, Nakhon Pathom so that they were able to learn more to be suitable local-community based guides. The training course consisted of 6 elements consequently principles, purposes, trainee's requirement, and length of training time, contents, training methodologies, materials and measurement of the course.

The training curriculum course was consisted of the tour guide knowledge, the theory of community-based tourism, the agro-tourism, general tourism information, personality development and practical bases. In additional, the curriculum development evaluation revealed that the local community realized the overall of elderly guides' knowledge and comprehension was high.

**Keywords:** Guideline of Elderly Guides Training Curriculum Development, Local-Base Community Tourism, Elderly Tourist Guides

## I. INTRODUCTIONS

Today tourism is one of the fastest growing industries in the world. Tourism conducted by the local community in a rural area is known as Community Based Tourism (CBT). CBT can define as tourism owned and managed by the community and intended to deliver wider community benefits [4]. According to Jamal TB, Getz D, CBT provides the high possibility to create jobs, and generate entrepreneurial opportunities for local communities from a different background, skills, and experiences. CBT also can support the local community in generating income, diversifying the local economy, preserving culture, conserving the environment, and providing educational opportunities. In addition, CBT offers the local community with numerous sources of income; it becomes a poverty reduction tool.

Nowadays, tourism has developed into a complex service industry. Tourist guides have to present their high destinations in order to satisfy tourists. Tourist guides represent an important part of the tourism industry. Local tourist guides should provide the local community information and the most interesting sights of a destination. In order to become a tourist guide one must gain proper education and an appropriate certificate. For this reason, tourist guides should be sufficiently prepared.

Tourist guides, as representatives of a destination, country and national culture should be carefully selected and

trained. It is suggested that there are five different roles of tourist guide: leader, educator, public relations representative, host and conduit.

Tourist guides have a significant role in the process of making visitors feeling welcome in a destination and interpretation of sights. They can be a main element in the whole experience and impression of a destination. Therefore, tourist guides need an adequate tourism education the tourism in order to create their identity and image. Guide needs to acquire at least some ability to speak and understand the language of their market language.

Ideally, a curriculum for trainees with local knowledge gained from "life" experience, but with little or no background and experience as guides, would incorporate at least three types of training: (1) expansion and refinement of product knowledge (e.g., flora, fauna, geology, history, culture, and site knowledge), (2) language training where required, and (3) interpretive guiding skills for managing tourist experiences and delivering high-quality interpretation

When discussing the development of curriculum for speaking communicative English, some researchers suggested approaches and methods for teaching communicative English speaking. Jeremy suggested 5 principles for creating curriculum of communicative English speaking as follows. 1) It is necessary to ensure that learners have the will to communicate, and topics for communication should relate to

them. 2) Objectives of communication should be oriented towards content rather than forms of communication. 3) Good activities should be conducted in various languages and enable learners to use different forms of language. 4) Teachers should not correct learners' mistakes immediately while learners are doing activities. 5) Teachers should not force or control learners to use only one specific form of language.

Wendy mentioned principles for creating curriculum of communicative English speaking so that teachers could apply them in practice. The principles are listed as follows; 1) Learners need to be informed about objectives for learning from different types of materials such as listening to news and weather forecast from the radios, reading advice, giving directions, and writing letters. For this reason, learners will concentrate on activities they are engaging in order to achieve the goals. 2) Learners have to fully comprehend the language use, not just selected parts for communication, so that they can communicate under certain circumstances efficiently. 3) The communication process is as important as forms of language. As a result, communication development should be as close to the real situation as possible. 4) Teachers should create appropriate activities to enable learners to learn through practice. 5) Teachers should encourage learners when they make grammatical or pronunciation mistakes and give them a chance to correcting their mistakes. Using this method can help learners to become more confident of using language. 6) In conclusion, speaking during communication activities that are used for speaking skills improvement can give a chance to and encourage learners to practice using their language. Thus, the role of teachers is not as a dictator but an advisor who sets learning goals of each of the activities for learners. They should explain instructions clearly so that the process of exchanging information while doing activities can be done smoothly and efficiently.

## II. OBJECTIVES OF THE RESEARCH

*This research objective;*

To study the guideline of the elderly tourist guides curriculum development on the local community tourism in Koh Lad E-tan district.

### Scopes of the Research

*The scope of the research was divided into three parts as follows;*

1. Area Scope: Koh Lad E-tan district is located in Nakhonpathom province
2. Content Scope: the theories of local-based community tourism as well as the factors and characteristics of the tourist guide training program, and the related researches.

3. Population Scope: 30 local residents in Koh Lad E-tan district, Nakhonpathom, who participated in the training of the elderly tourist guide curriculum. The training was run from 12-29 July, 2018. It was a project of Re-Profile by Nakhon Pathom Rajabhat University which was launched between July and August in 2018.

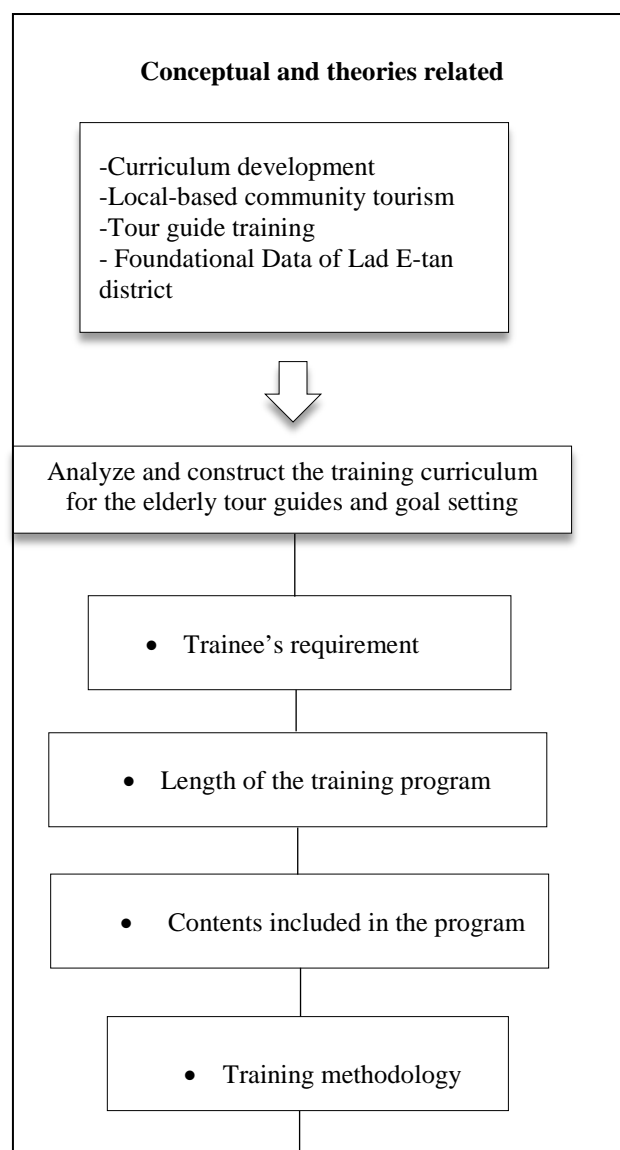
## III. RESEARCH BENEFITS

The research focused on two objectives which were as follows;

1 To comprehend the elderly tourist guide promotion in Koh Lad E-tan district.

2 To enable to form the guidelines for elderly tourist guide training curriculum development in Koh Lad E-tan district.

## Conceptual Framework





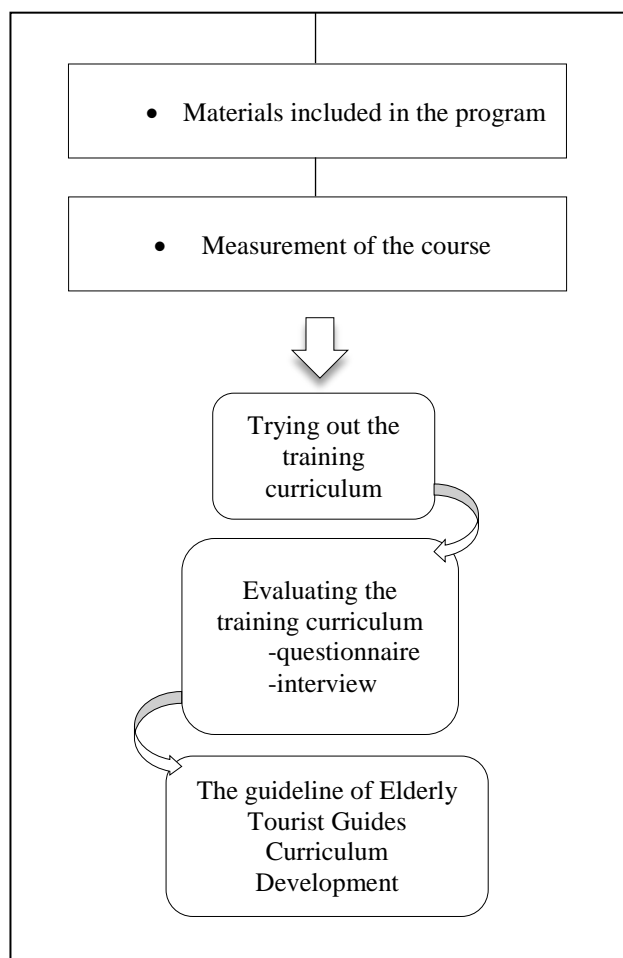


Fig. 1 Conceptual Framework

#### IV.METHODS

This research was conducted through 3 main methods which can be described as follows;

**1. Population of the study:** The local residents of Lad E-tan district, who engaged the program and provided essential foundational data of the district were the population of the study.

**2. Sample group:** There were several group of residents. 30 people were selected in total that included; 1) 3 local leaders of Lad E-tan district, 2) 6 elderly tourist guides in Lad E-tan district, 3) 18 local residents in Lad E-tan district.

**3. Research instrument:** These were comprised of an interview and a survey. The information was later verified and analyzed.

**4. An analysis based:** All data gathered was analyzed and conducted in accordance with the research objectives

#### V. RESEARCH RESULTS AND DISCUSSIONS

It was found that most participants agreed that a tour guide development was one of the most important factors to promote the local tourism. The results were able to be divided into two parts these were the guideline of the local tourist

curriculum development and the capacity of the elder tour guide.

From the survey, the result showed the considerations from the participants consisted of four components affecting on the success of the curriculum. These were; 1) the trainees' ages, 2) the trainees' background knowledge, 3) the curriculum format, and 4) the trainee's time and efforts.

From these considerations the curriculum development can be divided into 7 steps as follows; 1) sharing the ideas of creating the project, 2) collecting the information by video- recording of the interview, 3) analyzing the information, 4) producing the hand out for the training course, 5) starting the training course, 6) allowing the participants' essential language for tourist guide and 7) giving feedback of the training.



Fig. 2 Activities during the program

#### VI.CONCLUSIONS AND RECOMMENDATION

The level of ability of local community tour guides is a factor which could help them to improve the tourism community of Koh Lad E-tan district. In addition, the tour guides are as important as the tourist attraction itself. As a result, some interesting places at Koh Lad E-tan should be promoted as a cultural tourism sites. Those 5 famous places in Koh Lad E-Tan are: 1) Wat Song Ka Nong, 2) The Hanging Legs Noodles, 3) Pomelo garden, 4) Bahn Suan Bang Toey Home Sta, and 5) Moo Ban Klong Pee Suer Museum, which shows the agricultural equipment from the ancient time up to present.

The participants' expectations of training courses and the promotion for the elderly tourist guides in Koh Lad E-Tan are included in the following section. Koh Lad E-tan is considered to be the premier tourist attraction at Samphran District, Nakhon Pathom. It is flat area which was created by canal digging. The mouth of the canal is between Song Khanong and Homkret district. The area is rich in minerals and has an abundance of water which is suitable for orchard and mixed garden cultivation. Koh Lad E-tan is promoted by local resident as a cultural tourism site.

Not only does the research findings reveal that the local-based community promotion has served a number of visitors in the local area, but it also focuses on the local residents' ability to the tourism for sustaining: their environment, society, and culture. The community's cooperation and



motivation for the project of local-based community based tourism are very essential. Tipsuda suggested that the rural residents should realize the importance of natural resource conservation and the civil society. Further studies would be dedicated to the field of innovative training courses to promote local-based community tourism more efficiently.

#### ACKNOWLEDGEMENT

This research would not have been completed without the well-cooperation of community in Koh Lad E-tan district, Nakhon Pathom Province. The researchers were grateful to all local residents, administrators, leaders and elderly tourist guides in Koh Lad E-tan district participated in the project for the training period of two months. The most important is the wish to thank Nakhon Pathom Rajabhat University and the Re-profile staffs that provide great assists and collaboration during the program.

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# The comparative study of cultures between ASEAN and the plus three countries

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## Abstract

Qualitative research was carried out in order to compare the cultures between ASEAN and the Plus Three Countries. The plus three countries are China, Korea and Japan. The researcher collected data using documentary research. The results of the research indicated that the cultures between ASEAN and the plus three countries differ as a result of diverse historical experiences. The Southeast Asian countries were found to have stronger ties with rice than any other nations. It was found that different cultural spheres shaped Southeast Asian countries. Thailand, Cambodia, Myanmar, Laos were influenced by the Indic cultural sphere whereas Malaysia, Brunei and Indonesia were influenced India and Islam. The Philippines was found to be the most westernized of the ASEAN members. This was thought to be due to their European cultural roots (Roman Catholicism for example). Singapore was found to be more influenced by Chinese culture because of the Chinese migrants rather than its' interaction with the mainland and the British colonialists. Vietnam was found to be influenced by the Chinese cultural sphere. Of the 'plus three countries', China has occupied the prominent, central role in East Asia for most of recorded history. It deeply influenced the culture of the peripheral countries. Chinese writing concepts were passed on to Korea, and Japan, these nations developed their own characteristic writing systems as the cultural expression of their own language.

**Keyword:** Comparative study, Cultures, ASEAN + 3

## I. INTRODUCTION

The Association of Southeast Asian Nations (ASEAN) was established on 8 August 1967 in Bangkok, Thailand, with the signing of the ASEAN Declaration (the Bangkok Declaration). The Declaration was signed by the founding members of ASEAN, namely Indonesia, Malaysia, Philippines, Singapore and Thailand, also known as ASEAN-5. Brunei Darussalam joined the association on 7 January 1984, followed by Viet Nam on 28 July 1995, Lao People's Democratic Republic (PDR) and Myanmar on 23 July 1997, and Cambodia on 30 April 1999, making up what is today the ten ASEAN Member States (AMS) or ASEAN-10. The latter four i.e. Cambodia, Lao PDR, Myanmar and Viet Nam are also known as "CLMV Countries" [1].

The ASEAN Community was formally established on 31 December 2015, comprising the ASEAN Political-Security Community, the ASEAN Economic Community and the ASEAN Socio-Cultural Community. For the next ten years, ASEAN integration will be guided by the ASEAN Community Vision 2025 and its three corresponding 2025 Community Blueprints. The continuing joint efforts of the ASEAN community have had a stronger influence on the region's trade and the political and security environment than its members could have achieved individually [2].

The ASEAN Plus Three (APT) cooperation process began in December 1997 with the convening of an Informal Summit among the Leaders of ASEAN and China, Japan and the ROK at the sidelines of the Second ASEAN Informal Summit in Malaysia. The APT Summit was institutionalized in 1999 when the Leaders issued a Joint Statement on East

Asia Cooperation at the Third APT Summit in Manila. The Joint Statement for the first time determined the main

objectives, principles and further directions of APT countries cooperation. In the Joint Statement, the APT Leaders resolved to strengthen and deepen East Asia cooperation at various levels and in various areas, particularly in economic and social, political and other fields [3].

ASEAN and the plus three countries face the global crisis of economic downturn and climate change disasters, arts for all that connects the masses through cultural symbols they understand must be dynamically applied as a learning tool for capacity and confidence building to protect our bio-cultural diversity, strengthen the spirit and nourish the memory of kinship among ASEAN and the plus three countries' peoples to triumph over adversity. To maintain and preserve our unique and diverse culture amidst the forces of globalization and to fast track our goal to forge one caring, sharing ASEAN Community and the plus three countries.

## II. RESEARCH PURPOSES

The purposes of this research were to compare the cultures between ASEAN and the plus three countries.

## III. RESEARCH METHODOLOGY

### A. Research Design

*This study were a qualitative research by documentary research by document from Thai and foreign study. The scope of the study is the time period 1967-2017 AD.*

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### B. Data collection Method

The data for this research was collected through documentary research, in the form of electronic and non-electronic that were printed to public.

### C. Data Analysis

Data obtained through the documentary was analyzed data, it is proved reliability that is correct or not, by checking in Data Triangulation and prove that data is correct or not, method of checking is from person, time, and location to check how reliability and familiar it is, and analyze data, we used content analysis in data analysis, using frame of idea synthesized from reviewing literary work in analyzing data.

## IV. RESULTS

The findings obtained from the qualitative approach showed as following [4] [5] [6]:

### *Culture of Brunei*

A range of different cultures influenced the cultural development of Brunei. Due to its close proximity, Malay culture has had the biggest influence but other groups including Chinese, Indians and indigenous minorities have also added their contributions to the rich heritage of this Southeast Asian Muslim nation. Islamic architecture has been an important feature of Brunei's urban centers for centuries. Some of the initial Spanish visitors to Brunei in the 16th century noted the beauty of its architecture, especially a grand five-story mosque on the water that was destroyed during the Second World War. Other mosques have been built since. Completed in 1958, the Omar Ali Saifuddien Mosque was built for and named after the present Sultan's father. The opulence contained within the mosque highlights the importance of both the Islamic faith and the Sultan to Brunei's identity. The cuisine of Brunei draws most heavily upon the culinary traditions of nearby Malaysia, Indonesia and Singapore, with additional influences from countries further afield, such as China or India.

### *Culture of Cambodia*

Cambodian culture features a merging of influences, including Khmer, Hinduism, Theravada Buddhism, Chinese, French colonialism and the growing impact of globalization. A strong sense of cultural identity combined with numerous outside influences has led to modern Cambodians being proud of their country while also being accepting of external cultures. Fusion of Cambodian and non-native cultures is common and can be seen in Cambodia's architecture, art, music, film and food. One of the strongest influences upon Cambodian culture and identity is Theravada Buddhism, which replaced Hinduism and Mahayana Buddhism as the dominant belief system in Cambodia during the tail end of the Khmer Empire. This shift is reflected at Angkor Wat, which was initially a Hindu temple before being redesignated as a compound for Buddhist worship. One of Cambodia's signature dishes, amok fish, is a fragrant fish curry that can range in thickness from a creamy mousse to a more watered-down soup.

### *Culture of Indonesia*

Given its hundreds of ethnic groups, indigenous peoples and languages, as well as its biodiversity, there should be no

surprise that Indonesian culture is rich and diverse. The country is also a melting pot of religious traditions. Not only does it have six officially recognized religions Islam, Protestantism, Catholicism, Hinduism, Buddhism and Confucianism these varying belief systems are often integrated with local animist traditions or even with each other. Sculpture traditions are highly developed in Indonesia and vary throughout the archipelago. Hindu and Buddhist temples on Java and Bali are show cases of the stone sculpture skills that dominated the islands during the early to middle Srivijaya Empire. Wooden sculpture and woodcarvings by Indonesian artisans are world-renowned, particularly in Bali and Iepara, which are famous for their elaborate masks and furniture, respectively.

### *Culture of Laos*

Lao culture, along with the dominant cultures in Myanmar, Thailand and Cambodia, was influence early on by Indian culture. The Annamite Range in the country's east is effectively Where Indian influence in Southeast Asia stops and Chinese influence begins. But there is more to Lao culture than just Indian roots. During the Lan Xang era, a distinct Lao cultural identity was created, one that still reverberates today. A major component of this cultural identity is Theravada Buddhism, which permeates the literature, song and dance that emerged during the Lan Xang era, especially during the reign of King Visoun in the 16th century. Due to its central location in continental Southeast Asia as well as to colonialism, Lao culture has also been heavily influenced by the cultures of Thailand, Cambodia, Vietnam, China and France. This unique mix of different cultures is part of the reason for the country's recent inbound tourism growth.

### *Culture of Malaysia*

Malaysian culture is a rich melange of different Asian traditions, including indigenous, Malay, Chinese and Indian influences. As a Muslim country, Islam has also had a major impact on Malaysia's culture. This microcosm of Asia has also absorbed the influences of Arabic, British and Persian cultures. These varying cultures are represented across Malaysia in the country's language, architecture, music, dance, art and cuisine. The traditional arts of Malaysia tend to revolve around handicrafts. Silversmithing became a royal court craft around the late 17th century, leading to a legacy of vessels, jewelry and cutlery wrought from gold and silver. A strong oral history also lives on in Malaysia with a rich repertoire of folktales that retain various cultural influences. Cultural and religious tolerance is a defining characteristic of Malaysian society. Although Islam is the state religion, the constitution of Malaysia guarantees freedom of religion.

### *Culture of Myanmar*

Early Burmese culture was heavily influenced by India and Hindu and Buddhist beliefs. Later influences include China's Yunnan province, with the United Kingdom and Japan also contributing to Myanmar's cultural crucible.

First-time Visitors to the country will notice the ubiquitous longyi, the Burmese-style sarongs Worn by both men and Women. The thanaka paste is reputed to be effective as a skin care treatment as well as a sunblock. In local culture, there are 10 traditional arts, which include metalworking, woodcarving, goldsmithing, stucco relief, masonry, stone carving, woodturning, painting, lacquerware and bronze

casting. In Myanmar's larger cities, traditional temples and pagodas often mix with colonial era buildings built by the British as well as modern buildings. Traditional Burmese music, dance and performance arts draw heavily upon Buddhist themes. Burmese cuisine features indigenous ingredients and flavors combined with influences of the neighboring cuisines of India, China and Thailand.

#### *Culture of Philippine*

Existing at the crossroads of East Asia, Southeast Asia and the South Pacific, and a former Spanish and American colony. About 55 percent of Filipinos speak Tagalog, which forms the basis of Filipino, the official language. There are 111 other indigenous dialects spoken throughout the country with only about 10 of them recognized as regionally important. Underscoring the diversity of the Philippines is the fact that English is most commonly used in schools, government and business, and it is widely understood. The Philippines is home to the third-largest English speaking population in the world behind the United States and the United Kingdom. Religion is one of the areas in which the Philippines diverges from the most from the rest of Southeast Asia. It is the only predominantly Christian country in South east Asia. The country's southern islands are primarily Muslim, with Sharia courts deciding certain legal, ethical and moral issues pertaining to Islam.

#### *Culture of Singapore*

Singapore blends Asian and European cultures into something uniquely Singaporean. Fiercer proud of their multicultural, cosmopolitan citystate and often of their political leaders, Singapore has a population that includes people of Chinese, Malay, Indian, Caucasian and Eurasian descent along with various mixed groups and other Asian ethnicities. As a result, a large number of Singaporeans are bilingual and many are comfortable in multiple cultures. Also, just about everyone speaks English due to compulsory study in school. The government is secular but it regularly emphasizes respect for multiple religions and beliefs. In fact, one study by the Pew Research Center found Singapore to be the most religiously diverse nation in the world, even if about a third of Singaporeans are Buddhist and 15 percent are Muslims. At the same time, various ethnic groups often co-exist in areas that are clearly marked, such as Little India, Chinatown and Kampong Glam.

#### *Culture of Thailand*

Thai culture is a unique melting pot that combines the traditions of the ethnic Tai peoples that inhabit the kingdom with animism, Buddhism, Hinduism and Khmer influences. Later arrivals from northern India and southern China have also had a substantial impact on the culture of present-day Thailand. Thai architecture was influenced just as much by its geography, climate and religious traditions as it was by the fluctuating borders of the neighbouring Burmese and Khmer kingdoms. Temples such as Wat Phra Kaew, Wat Arun and Wat Pho in Bangkok and the all White Wat Rong Khun in Chiang Rai are among the kingdom's most popular tourist destinations. The height of Thai architecture and extravagance is undoubtedly the Grand Palace, which dominates the old part of Bangkok along the Chao Phraya River.

#### *Culture of Vietnam*

The culture of Vietnam is a unique blend of indigenous and outside traditions, with the north having been heavily influenced by Chinese culture and the south marking the easternmost region of Indian influence on the Eurasian continent. The performing arts are very much alive in Vietnam. Water puppetry, typically enjoyed in the northern provinces, is one of the more unique manifestations of theater in Vietnam. The most common traditional Vietnamese clothing is the no dai, which was once worn by both sexes but today is worn by females only. The ao dai is a gown that is slit high on both sides and paired with cotton or silk trousers recognized beyond Vietnam's borders. Vietnam is a melting pot of religions, with the three most dominant belief systems being Buddhism, Confucianism and Taoism. French colonialism also introduced Catholicism to Vietnam. The religion is difficult to define with one word, as it draws upon elements from multiple religious traditions as well as animism and ancestor worship.

#### *Culture of China*

Few countries have had as much of a cultural impact on the rest of the world as China. Among its inventions, China claims the compass, papermaking, gunpowder and printing all of which changed the World irrevocably. Chinese food is popular around the globe and has been a major influence across East and Southeast Asia. Tea, now a global beverage, also originated in China. What follows is a small sampling of the contributions that China has made to human culture. Chinese festivals, most of which are linked to the lunar calendar, are celebrated across China and by Chinese communities worldwide. Chinese New Year, also known as Spring Festival, is the biggest celebration of the year, marking the end of winter and the arrival of the growing season. Eating is a major part of the Chinese experience. The ideal meal involves several friends and even more dishes.

#### *Culture of Japan*

One of the most common traditional uses of ceramics is in the Japanese tea ceremony, a highly refined ritual in which every object and movement is rich in significance. Japan has an admirable visual arts heritage from its take on traditional Chinese painting and calligraphy to ukiyo-e (literally "paintings of the floating world") woodblock printing. Mahayana Buddhism's journey from China to Japan also brought with it a zeal for Buddhist sculptures, many of which have survived the centuries in temples across the country. The paper-folding art of origami and the flower arranging of ikebana are Japanese art forms that are easy for anyone to begin to learn but require long practice to master. The traditional Japanese tendency to seek the art in any task manifests itself in martial arts such as karate, in which proper form is crucial. It is difficult to say whether sumo wrestling is sport masquerading as theater or vice versa. Even social interaction can be turned into a performing art, as illustrated by the tradition of the geisha.

#### *Culture of South Korea*

South Korea may be a hotbed for regional and global trends, but it also has a highly developed traditional culture that was influenced in ancient times by China and Buddhism and more recently by the United States. Traditional Korean folk music comes in many varieties. Pungmul is a dynamic

combination of percussion, singing and nonstop dancing. Pansori is a storytelling art involving one drummer and one singer. The “farmers’ music” known as nongak evolved out of common spaces in Korean villages. The country’s Shamanic influences are brought to life by the music known as shinawi, which has long been part of Korea’s kut, or indigenous religious ceremonies.

## V. COMPARE BY TABLE AND CONCLUSION

TABLE I. CULTURES OF ASEAN +3

CULTURES	ASEAN +3
Indic cultural sphere	Thailand, Cambodia, Myanmar, and Laos
India and Islam cultural sphere	Malaysia, Brunei and Indonesia
European cultural roots	Philippines
Chinese cultural sphere	Singapore, Vietnam, Chinese Korea, and Japan

ASEAN and the Plus Three countries’ diversity are reflected in the colorful lives of its people. ASEAN and the Plus Three countries’ people are greatly influenced by the region’s rich history, diverse customs and traditions, religious beliefs, economic progress, innovation, and technological sophistication. Their cultures have been molded by time into a gigantic melting pot of Indian, Chinese, Portuguese, Spanish, American, and indigenous Malay influences, making it one of the most interesting places in the world. Islam and Buddhism are widely practiced in the mainland Southeast Asia while ASEAN peoples, especially the Philippines, are largely Roman Catholic. Hinduism and Christianity are also practiced region-wide. Various languages are spoken in ASEAN, with each ASEAN country having their own official languages and wide ranging list of dialects. English, however, is the official business language of majority of ASEAN countries. ASEAN and the Plus Three countries’ people are known for their hospitality, graciousness, dynamism, and family values. They take pride in their colorful art and heritage as evident in the region’s ancient architecture, folk dances, traditional music, and literature. The Cultures of ASEAN and the Plus Three countries are shown in the Table 1.

## VI. DEBATE AND SUGGESTION FORM RESEARCH

Additional further study should include research on the direct impact of national culture on ASEAN+3. This knowledge would be of immediate benefit to the next researches. Another area that was beyond the scope of this study is a comparison between national cultures for the next researches. It is possible that the next researches may show different results.

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# **Session of Buddhism for Thailand 4.0**

# The principles of social development in Theravada Buddhist philosophy

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## Abstract

The aim of this study was to find out the principles of social development in Theravada Buddhist philosophy. It was found that two dhammas are the basis of human social development. These were, 1) Lokapala-dhamma-2: shame at doing evil (Hiri) and fear of the results of doing evil (Ottappa) and 2) Panja Sila: no killing, no stealing, no lying, no sexual misconduct and no taking of intoxicants. Moreover, the other Buddhist philosophies that help and support the development of human society were found to be; Sangahavathu-4: giving (Dana), amicable speech (Piyavaca), helpful action (Atthacariya) and participation (Samanattata). Brahmavihara-4: loving-kindness (Metta), compassion (Karuna), empathetic joy (Mutita) and equanimity (Upekkha). Agati-4: prejudice caused by love (Chandagati), prejudice caused by hatred (Dasagati), prejudice caused by delusion (Mohagati) and prejudice caused by fear (Bhayagati). Gharavasa-dhamma-4: truth (Sacca), self-control (Dama), patience (Khanti) and charity (Caga). Suhadamitta-4: the helper, the man who is the same in weal and woe, the man who gives good counsel and the man who sympathizes. Saraoayadhamma-6: to be amiable in deed, to be amiable in word, to be amiable in thought, to share any lawful gains with virtuous fellows, to keep without blemish the rules of conduct along with one's fellows and to be endowed with right views along with one's fellows. Aparihaniyadhamma-7: to hold regular and frequent meetings, to meet together in harmony, to introduce no revolutionary ordinance, to honor and respect the elders, the women and girls of the families are to dwell without being forced or abducted, to honor and worship the monuments and to provide the rightful protection.

**Keywords:** principles, social development, Theravada Buddhist philosophy

## I. INTRODUCTION

Buddhism admits the individual personality, stating that each person has the right to experience personally. Buddhist social forms aim at promoting mundane equality and maximum freedom, even though they are incapable of creating everlasting peace and contentment in mind. Buddhist society is not to provide home for human beings, but help people to search for a way to go beyond sickness, aging and death.

Western scholars have looked at Buddhism in a different light. Trevor Ling, an authoritative modern Western writer on Buddhism says that "we merely prejudice our understanding of the Buddha's historical significance if we think of him as the founder of a religion in the customary modern sense of the term" and goes on to add that "in one sense of the word 'religion' denoting beliefs and practices connected with spirit-beings, Buddhism was in origin not a religion, but a non-religious philosophy... In the other, more sophisticated meaning of the word 'religion', Buddhism in its Asian setting remains in certain respects what it was in origin, a way of attempting to restructure human consciousness and the common life of men in accordance with the nature of what it conceives to be the sacred reality". (Trevor Ling. 1973 ; 22-64.

What's more, Buddhism encourages morality in a society. Buddhism suggests that a good society is one where all the people are good people from within. Each person improves himself/ herself from within, the whole society will become a well-modeled society. Buddhism focuses more on individual than the system, stressing that the problems of human beings should be corrected within human beings but not in the system. The Buddha teaches that the best society is

one with a democracy of socialism administrated by people who are concerned a lot about the well-beings of its people. Buddhist social philosophy is based on the liberation from suffering and endeavor to make an equal, free, democratic and stable society.

## II. BUDDHISM AND SOCIAL PHILOSOPHY

Buddhist Social philosophy, has to do with the social dimension of Buddhism the importance of which our country has not yet grasped, in spite of regaining independence over half a century ago. I venture to think that had Sir D.B. lived to see the dawn of independence and continued to occupy the pre-eminent position he already had achieved in the public affairs of this country, he might well have put in place a system of governance on the basis of the core values of the Buddha's social thought. (Capriles, Elías. 2011)

Buddhism aims to be a social and political philosophy that is democratic in ethos. There is no place for supernatural entities; indeed, we are not concerned about whether there is a God or not, or if there is an afterlife or not, or a day of reckoning or redemption. The main concern is the problem faced by all human beings, dukkha (suffering), and its causes and the answer to it. The Buddha did not blame any supernatural entity for the existence of dukkha, but prevailing social conditions and the personal conduct of the individual. He taught that the only way to get rid of dukkha was not by pleasing any supernatural entity but by the reorganization of society and improved personal conduct. This is why the Buddha preached that greed or excessive desire was the cause of all dukkha and hence restraint was required. (Kalupahana, David. 1994)

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Buddha taught and practiced both equality and liberty. He liberated the shudras from slavery. He also taught and practiced equality between genders and treated women as equal in all aspects of life, bestowing the priesthood upon them. Both shudras and women were denied this liberty and equality by the chaturvarna practices prior to and during the advent of Buddhism. Buddha did not stop here, but also propagated fraternity, which is one more principle required not only for democracy, but even for peaceful coexistence of humanity. This is a concept neglected by both Western and Eastern philosophers. The present turmoils of violence by terrorist activities as well as similar state activities are a result of ignoring the concept of fraternity, so strongly propagated by Buddha. We might say, therefore, that the Buddha was the first political philosopher who taught liberty, equality and fraternity, the basic requirements for meaningful democracy and peaceful coexistence of humanity.

### III. THE THERAVADA BUDDHIST PHILOSOPHY PRINCIPLES OF SOCIAL DEVELOPMENT

Some argue that Buddhism offers no social philosophy. However, this argument makes no sense since it all depends on how we define social philosophy. If social philosophy refers to social morality that governs people's behaviors, Buddhism has many teachings on this sense, like Lokapala-dhamma-2 (Hiri-Ottappa) and the Five Precepts (Panja Sila) and so on. But if the social philosophy refers to the way to organize the structure of society, Buddhism stands outside.

#### A. Hiri- Ottappa (*Guardians of the World*)

Hiri-Ottappa: 'moral shame and Fear of Wrongdoing', are associated with all kammically advantageous consciousness. (Nyanatiloka. 2007) The Buddha's superheroes, "two bright qualities that protect the world" people have always been interested in superheroes, and lately, as blockbusters inundate us, a new wave of interest is swelling. We like the idea of someone with special powers watching over us, ready to intervene in a crisis and keep us safe from dark forces. The Buddha also spoke of two superheroes he called "the two bright qualities [that] protect the world". These are Hiri, or conscience, and Ottappa, our respect for others. Hiri and Ottappa do not fly around the universe in spaceships, shooting lasers. They are found patrolling the depths of the human psyche, where they swoop in to thwart the evil masterminds who concoct our suffering and plot to destroy our world.

Fortunately Hiri and Ottappa have other friends, including Sati, or mindfulness, who goes first into every fray and summons the team into action. Sati is conscious awareness of what is happening right now, and Ahiri and Anottappa can only function when such awareness is absent. When people do harm to themselves and others, they are often not aware of what they are doing. They are conscious enough to act, but not conscious enough to be aware of the quality of their actions or of their consequences. Whenever a person musters even a degree of mindfulness, conscience and respect arrive there too, helping them do, say, and think what is helpful rather than what is harmful.

The superheroes we need don't come from faraway planets or live in secret hideouts on remote islands. Our heroes

must be summoned from within. It's up to us to put them to work and to learn how to save ourselves.

#### B. Panja Sila (*the Five Precepts*)

The Panja Sila or the Five Precepts provide the basis for Buddhist social ethics. They are capable of guaranteeing to the people, in moral terms, the security of life and property and ensuring peace and harmony among the people. Each of the precepts has a positive as well as a negative aspect. A member of the Buddhist Society is one who has given an oath to himself; he has promised to himself that having realized the sanctity of life, he will not destroy it and practice loving kindness to all beings; he will refrain from stealing and respect others' property rights; he will refrain from sexual misconduct and conduct himself morally in a manner that will not offend others; he will refrain from lying and be truthful in words and deeds; he will refrain from taking intoxicating drinks and drugs and be mindful of his duties to others. (Gombrich, Richard F. 1997)

On the social level, sila contributes to harmonious and peaceful coexistence among community members and consequently helps to promote social growth and development. In a society where morality prevails and members are conscious of their roles, there will be general security, mutual trust, and close cooperation, these in turn leading to greater progress and prosperity. Without morality there will be corruption and disturbance, and all members of society are adversely affected. Most of the problems that society experiences today are connected, directly or indirectly, with a lack of good morality.

Questions of morality always concern the issues of right and wrong, good and evil. For a moral life to be meaningful these issues must not remain mere theoretical principles, but translated into practice. Good must be performed, evil must be given up. It is not enough to know what is good or evil, we also need to take proper action with respect to them. We need concrete guidelines to follow, and these are provided by the Buddhist moral precepts. Even the oft-quoted Buddhist ideals of abstention from evil, implementation of what is good, and perfect mental purification can be initially actualized through a consistent practice of moral precepts. The precepts help us to live those ideals; they teach us to do the right things and to avoid the wrong.

Buddhist moral precepts provide a wholesome foundation for personal and social growth. They are practical principles for a good life and the cultivation of virtues. If we understand the objectives of sila and realize its benefits, we will see moral precepts as an integral part of life rather than as a burden that we are compelled to shoulder. Buddhist moral precepts are not commandments imposed by force; they are a course of training willingly undertaken in order to achieve a desired objective. We do not practice to please a supreme being, but for our own good and the good of society. As individuals, we need to train in morality to lead a good and noble life. On the social level, we need to help maintain peace and harmony in society and facilitate the progress of the common good. The practice of moral precepts is essential in this regard.



Buddhist moral precepts are based on the Dhamma, and they reflect such eternal values as compassion, respect, self-restraint, honesty, and wisdom. These are values that are cherished by all civilizations, and their significance is universally recognized. Moral precepts that are based on such values or directed toward their realization will always be relevant to human society, no matter to what extent it has developed. Moreover, their validity can be empirically tested on the basis of one's own sensitivity and conscience, which are beyond factors of time and place. Killing, for instance, is objectionable when considered from the perspective of oneself being the victim of the action (although when other lives are subjected to the same act, its undesirability may not be felt as strongly). The same is true with regard to stealing, lying, and sexual misconduct. Because Buddhist moral precepts are grounded on these factors, their practicality remains intact even today, and their usefulness is beyond question.

#### IV. THE SUPPORTING THERAVADA BUDDHIST PHILOSOPHY OF SOCIAL DEVELOPMENT

The Buddhist tradition makes the claim that among persons that appear in this world for the welfare of man-kind, a fully enlightened Buddha is the greatest.' The Buddhist terms used in the sense of 'welfare' are terms such as 'attha', 'Ma'and sukha'. The claim made by Buddhism is that the Buddha engaged in a serious search of what in reality conduces to welfare. According to the Ariyapariyesana Sutta he left the mundane comforts of the royal palace disenchanted with the so-called pleasures of the mundane life in search of what constitutes the greatest good of mankind

Buddhism, however, brought about a more sophisticated and nuanced understanding of religion as a set of principles within the domain of sociology and psychology, not theology. Buddhism is an ideology that analyses and provides practical solutions to basic problems of human existence: that every living being must undergo suffering, and every living being must raise himself or herself out of it. There are the supporting Theravada Buddhist Philosophy of social development as follows

##### A. Sanghavatthu-4 (Guardians of the World)

The Sangaha-vatthu means qualities that bond people in unity or principles for helpful integration. (Sarint Choun. 2016). The four principles are: (1) Dāna: giving; sacrificing, sharing his own things with others; not being stingy and selfish. This principle helps people to be free from selfishness. We have to realize that the wealth that we earn is not permanent. When we pass away, we cannot take it with us. (2) Piyavāca: amicable speech; speaking words that are polite; sincere, abstaining from harsh speech; speaking the words that are useful. The Buddha gives much importance to speech because speech is the first step for producing harmony and friendship, (3) Atthacariya: helpful action; performing actions that are useful to other people, (4) Samanattata: participation; behaving consistently and impartially; behaving equitably toward all people. This principle helps us to have a firm mind, and in addition it produces admirableness and truthfulness, the four Saṅgha vatthu for rule and ways of practice social

development; the four principles of service (Sanghaha Vathu) can be applied to social development for instance: the Dāna which is giving; share some food for earthquake victims; the Piyavācā or kind speech, speak to them nicely, not rude; Atthacariyā or useful conduct, help them in other ways, doing well and Samānattatā or even and equal treatment, to the keep visiting them for sustainable recovery; the four principles of service are needed and important when applying to social development.

Research indicates that The aspiration or approach to strengthen the peace community of volunteers of Ministry of Social Development and Human Security, Pathum Thani province is consistent with the main object Sangahavatthu 4 extremely well. It said that the main object Sangahavatthu 4 are the principles that promote building peace community and it is possible to achieve truly peace social.

##### B. Brahnavihara-4

The 4 Brahma Vihara Dhamas: Buddhist Tenets for Boundless Peace, Harmony, and Happiness The 4 Brahma Vihara Dhamas as specified in Buddhism comprises the following 4 sublime conditions of the mind: Metta or compassionate loving-kindness, Karuna or compassionate sympathy, Mutita or compassionate joy, and Ubeka or equanimity (Phra Brahmagunabhorn. 2548)

The 4 Brahma Vihara Dhamas are basic Buddhist tenets which one can cultivate towards the achievement of boundless peace, harmony, compassionate loving-kindness, and happiness, both internally within oneself and in one's relation with the surrounding universe.

##### C. Agati-4

Agati is refrain from the four kinds of biased conduct (agati) as under:

- Biased conduct on account of like (chandagati).
- Biased conduct on account of dislike (dosagati).
- Biased conduct on account of fear (bhayagati).
- Biased conduct on account of foolishness (mohagati).

##### D. Gharavasa-dhamma 4

Karawattham consists of two words.

The word "Karawat" means those who lives their lives in a worldly way or laymen; and "Tham (or Dhamma)" means the right ways, virtues, divine habits, qualifications, and practicing items. Karawattham means the qualifications of those succeed in their living in a worldly way, consisting of 4 items of Dhamma including :-

- 1) Sajja means true, direct, genuine, based on honesty and being a true person for one's human being.
- 2) Tama means practicing, forcing, maintaining and controlling the mind of oneself to reduce and give up passion as well as keep the truth.
- 3) Khanti means patience not only with sayings or actions of others but also with the drive of passion.
- 4) Jaka means devotion and donating things that should not belong to oneself, especially passion which should be avoided, as well as giving up bad habits.

### E. Saranya Dhamma 6

The Three Virtues are the basis for individual cultivation; whereas, the Six Principles of Harmony are the basis for group cultivation. The sangha is a group of four or more people who properly practice the Buddha's teaching together, especially the Six Principles of Harmony. (Bronkhorst, Johannes.1993). They are:

- 1) Sharing the same viewpoints or goals
- 2) Abiding by the same precepts
- 3) Living and practicing together harmoniously
- 4) No quarrelling
- 5) Experiencing the inner peace and happiness from practicing together harmoniously
- 6) Sharing benefits harmoniously

Sharing the same viewpoints means mutual understanding or agreement. (Edelglass, William. 2009). In order to establish an organization, there must be clear aims and objectives. Everyone in the organization should come together with the same intentions, thoughts and views. Thus, they will be able to focus themselves and work hard, so as to achieve, with one mind, the goals of the organization. If one's own opinion differs with the majority's, he or she should learn to put aside his/her opinions and embrace the majority's decision, as long as, the matter does not conflict with the aims and objectives of the organization. One should not cling to personal opinions and be individualistic; this may cause dispersion in the group.

### F. Aparihaniya Dhamma 7

The Seven Condition of Welfare, show how they are particularly useful to govern a country successfully. Instead of giving a direct answer, the Buddha spoke about the seven conditions conducive to the growth of a nation's welfare. He said that people should assemble in harmony, discuss their national affairs together, follow the established laws and not change them unreasonably. In addition, they should honor their parents, teachers and elders, lead a moral life, respect their religion, and follow the advice of the wise and the virtuous. As long as people followed this advice their nation would prosper. Satisfied with the answer, the minister left, promising to convey the Buddha's reply to his king. (Kalupahana, David J. 1992). The Buddha declared that:

- 1) as long as the Vajjians meet frequently and hold many meetings;
- 2) as long as they meet together in unity, rise in unity and perform their duties in unity;
- 3) as long as they enact nothing not enacted, abrogate nothing that has already been enacted, act in accordance with the already established ancient Vajjian principles;
- 4) as long as they support, respect, venerate and honour the Vajjian elders, and pay regard to their worthy speech;
- 5) as long as no women or girls of their families are detained by force or abduction;
- 6) as long as they support, respect, venerate, honour those objects of worship — internal and external — and do not neglect those righteous ceremonies held before;
- 7) as long as the rightful protection, defence and support

for the Arahants shall be provided by the Vajjians so that Arahants who have not come may enter the realm and those who have entered the realm may live in peace — so long may the Vajjians be expected not to decline, but to prosper. (Perdue.1992)

Hearing these seven conditions of welfare which the Buddha Himself taught the Vajjians, the Prime Minister, Vassakāra, took leave of the Buddha, fully convinced that the Vajjians could not be overcome by the King of Magadha in battle, without diplomacy or breaking up their alliance.

## V. CONCLUSION

The Buddhist ideology is based on the principles of equality, liberty and fraternity, which are the main pillars of modern democracy. It is a myth that the Buddha left his kingdom after observing misery; there is Buddhist evidence to suggest that Siddhartha left his home because he differed with other people responsible for governance in his republic over the method of resolving a dispute regarding the sharing of water resources with a neighbouring kingdom. The majority wanted to resolve this issue by war, whereas Siddhartha wanted to resolve it by discussion and negotiations.

Humanity is required to develop both physical and mental, well balanced development. The main Buddhist philosophies of social development are Hiri- Ottappa 2 (Guardians of the World) and Panja Sila (the Five Precepts. Both is as the core of social development and other Buddhist philosophy to support them, that is the cause to make the society of happiness to be sustainable.

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# A study on problems and challenges faced by people due to Uma Oya water multi-purpose development project (UMDP) in Badulla district

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## Abstract

The study mainly focused on problems and challenges faced by people due to Uma Oya water Multi – Purpose development project in the division of Bandarawela in Badulla District. The main objective of the study was to examine the problems and challenges faced by people due to the project. The sub objectives were; to identify the environmental impact of Uma Oya water project, to examine its' Socio cultural impact, to determine Psychological problems faced by the affected people during Uma Oya water project and to provide social work intervention for the Uma Oya water project. Interviews were conducted with a sample of 40 respondents who were affected by Uma Oya water Multi-purpose development Project. It was found that most of the people's houses and agricultural activities were in the area affected by the development. As a result of the project, economic, social and cultural backgrounds collapsed in the area. 80% of the respondents were found to suffer from water shortages, 80% of their agricultural fields were totally destroyed. In addition to this most of the houses suffered subsidence and 75% of them had cracks. At the time of the research new cracks were appearing in houses. Most of the water resources wells, spring water systems, climate system were affected by the development. In addition to this the development has led to a loss of bio diversity and geographical instability. These issues mainly affect the life styles of the people and further issues are arising day by day. The sample population of the study was selected from the population of the most affected area from the Uma Oya water project .The sampling method of this study was selected purposive sampling method. A purposive sampling method is non-random sample that selects respondents based on their characteristics and the objectives of the study. In this study qualitative and quantitative method (mix methods) were used when collecting data. Data was gathered using questionnaires and interviews and analysis was carried out using SPSS.

**Keyword:** Uma Oya water multi-purpose development project, development refugees, environmental impacts

## I.INTRODUCTION

The Researcher selected this project to understand the parties that are responsible for getting environmental recodes and complying with them. The aim of this research is to discuss environmental and social impacts of Uma Oya multipurpose development project and to debrief how mistakes from the past can be rectified for better implementation of such projects in future. While acknowledging the vast benefits that can be derived from such mega scale projects, the discussion details the negative impacts, too, in order that these issues are lessened. This is so that mega development constructions can be utilized as a positive development objective without hampering the well-being of the society, environment, and their interrelations.

The Uma Oya multi-purpose development project was started on 29/04/2008. This project was proposed to transfer water from Uma Oya to Kirindi Oya in order to develop hydropower and to irrigate the dry and less developed Southern region of Sri Lanka. It was expected that this project could provide water to the Hambantota Port, Weerawila International Airport and Hambantota Industrial zone as well. Since then up to now, the constructions have been going on for more than 8 years. Though more than half of the project has been constructed, it has with a significant environmental, economic and social impact which has affected the community and environment negatively.

The imperial powers that colonized Sri Lanka deliberately caused annoying afflictions to the people and to the natural environment to fulfill their indecent aims and objectives. They ravaged stupas,(Pagoda) shrines, temples and shelters of the people, killed fruit trees and cattle and caused irreversible damage to the forests, streams, springs, rivulets, brooks, runnels, rivers and tanks. By introducing legislation such as Barren Lands Ordinance they acquired lands of the national people coercively and acquired valuable environmentally sensitive lands for economic plantations. When they departed the country it was endowed to the native governors to country these were endowed to the native governors to continue the destruction. They have made away with the water springs, mountains and other natural resources and have created thousands and thousands of development refugees.

## II.OBJECTIVES

The main objective of this study is to examine problems and challenges faced by affected people during the Uma Oya project. This will mainly discuss Economic, environmental, psychological, socio cultural problems. The Sub Objectives are to examine Socio cultural impacts of the Uma Oya project, to identify the environmental impact of the Uma Oya project, to determine psychosocial problems faced by the affected people and to provide social work interventions to them.

### III. RESEARCH PROBLEM

It is undeniable that the development of the economy has brought great changes in everyone's life and significantly elevated our living standards. Some people therefore argue that the development of economy must come before everything else. Others believed that under no circumstances we should seek temporary economic development at the expense of the environment and resources. If we do so, we could never achieve sustainable development of economy, and such a practice is not in accordance with human welfare. If the government neglects the importance of environmental protection when promoting the economic development, it could make a profit in the short term but suffer a larger loss in the long run.

Sustainable development is a pattern of economic growth in which the use of resources aims to meet human needs while preserving the environment, so that those needs can be met not only in the present, but also for generations to come. Development projects are needed in developing countries such as Sri Lanka but those developments should be done only with the reconciliation of environmental protection and social well-being of the people. The government cannot improve people's lives through developing the economy at the expenses of environment and natural resources.

### IV. STUDY AREA

The concept of intragenerational equity requires equity within the generation. The natural resources of the country should be equitably distributed among the people of the country. It is said, that among the existing generation also the natural resources should be equitably distributed. By implementing this project the government has sought to generate intra generational equity by giving access to the water resources to the people in Southern areas. But it has been a challenge for the future and inter-generational equity. Briefly consider about the most affected area. This is Bandarawela. Within Bandarawela the most affected villages are Hil oya, Makullella, Weheragala, Thantiriya, Kinigama, Walasbadda, and Udaperuwa. The most significant area to consider Udapeuwa as most damages are there. In this study the main focus will be on this village because lots of subsidence and other various kinds of damages have happened in the area.

### V. RATIONAL OF THE STUDY

The vegetable production of Badulla District is 38% out of the hill country's total vegetable production. Out of it 35% of vegetable production occurs in the Uma Oya valley. The abuses and afflictions caused by the dam project are caused to such a valuable area. Even though physical development is an essential element of the lives of the people, so called development should not be done by abusing something, making others starve, making other areas become dry and by destroying streams, rivers, forests and nature.

At present, the water of Uma Oya has been accumulated in the Rantembe reservoir and diverted to Mahaweli C and Mahaweli B zones including Aralaganwila according to Mahaweli Master Plan. The Mahaweli project which was created in 1960 sought to obtain 45 millions of Cubic meters of waters from Uma Oya only in the months of June, July and

August. Hence, a further diversion of water to the South of the country could result a serious water shortage in Mahaweli C and B zones. This project could endanger an already developed area in the aim of solving the water crisis of another area. It will then be essential to provide water to meet the demand of water in Mahaweli C and B zones by implementing another irrigation project expending huge amounts of funds.

Further to this backdrop the project is carrying out in almost beautiful area in the country which has attracted the eye of the tourists due to its natural beauty and cool climates. Up country is the heart of Sri Lanka and now the heart is gradually getting perforated. The water streams of the area are drying up, ground water is falling off and the wet ground for the animals is disappearing and gradually becoming a desert. The beautiful scenic areas such as Bandarawela, Ella, NuwaraEliya, Diyatalawa, Welimada, Haputhale are dragged in to a dangerous destiny and becoming sterile areas. This project has created a number of Economic, social, environmental problems that have contributed to the economic and emotional deprivation of the people in this area. Therefore, it is necessary to minimize the Economic, psychological, cultural and environmental degradation in implementing these kinds of projects. The researcher selected this project to understand the parties that are responsible for getting environmental records and complying with them.

### VI. RESEARCH FINDINGS

Adverse Effects of the Project on the Residents in the area of the Uma Oya mega project have already caused enormous health, hygiene and livelihood problems to sections of people in Uva, especially in Bandarawela, Badulla areas. Lots of drinking water wells and even some waterfalls have gone dry in these areas. It is true that the Uma Oya project will help to cultivate more lands in Wellassa, and it will generate hydroelectricity, but adverse effects on the people need to be given high consideration. The main issue that has occurred since the inception of this project is the violation of the fundamental rights of the people living in the areas affected by the project. Displacement, loss of livelihood, violations of fundamental human rights and land dispossession are some of visible socio-economic impacts the residents of those areas are facing. Cave-ins and subsidence have impacted on the houses of the population and they have become places where people cannot live. At the same time there are potential health impacts to the residents including accidents, mental problems including stress, depression and suicide, occupational diseases and accidents. The residents of these areas have been unable to cultivate paddy rice and vegetables due to the drying of water springs since 2014. Landslides and stone quarry deterioration have also been some of the results of the project. Apart from that, the noise pollution in those areas can affect the hearing ability of people and causes disturbance to the education of the children.

The impacts of the project are suffered by people in three areas. These include the people who are directly displaced, people who live in the area downstream of Uma Oya who will suffer water shortages and the people who are living in the areas where the earth will be made unstable due to the tunneling process. People claim that their wells have dried up and turned into dry holes in the surrounding areas of the Uma

Oya, these have never dried up in the past 50 years. A larger number of wells have recorded a reduction in their water levels, and no water can be found underground. All this while at the same time their houses are being damaged by the contraction process of the project and they live in fear of landslides. Not only houses, but all other social infrastructure such as schools and places of worship, are continuing to crumble, while agricultural lands, the lifeblood of the communities, have become only sites of despair.

TABLE I NUMBER OF DAMAGED HOUSES IN SOME VILLAGE OFFICERS (GRAMANILADARI) DIVISIONS

	GS Division	Total number of families in the GS Division	Number of damaged houses
1	Udaperuwa	530	504
2	Makul Ella	569	533
3	Egodagama	525	432
4	Weheragala	480	448
5	Kinigama	564	70
6	Thanthiriya	635	123
	Total	3303	2110

Source: Serve data 2018

According to above data researcher identified most damages happen in Udaperuwa GN division that's why with the help of purposive sampling method select Udaperuwa GN division for the study. In this study area researcher gathered following data.

TABLE II. THE NUMBERS OF 653 WELLS DRIED ARE IN THESE AREAS

	Areas	Number of wells
1	Udaperuwa	173
2	Makul Ella	194
3	Egodagama	70
4	Weheragala	154
5	Kinigama	8
6	Thanthiriya	54
	Total	653

Source: Serve data 2018

Major income sources before and after project.

The Researcher identified the major sources of income in this area before the Uma Oya project disaster. According to the geographical location and climatic system most of the people were engaged in agricultural activities such as paddy rice growing, vegetables and gardening. According to the data 80% of people were engaged in agriculture activities. In ancient times they practiced agriculture as a major income source. This is clearly shown in pie chart. 10% Of the remaining population 10% government workers 8% were private workers and 2% of people worked for a daily wage.

The researcher was not able to identify significant differences of in sources of income. Before the Uma Oya project most people engaging agricultural activities with the help of

geographical location and climate system. During the Uma Oya project lot of damage was caused to the environment. Thousands of acres of agricultural lands have become unusable. Each and every water resource dried up, and lots of subsidence and cracks occurred in their agricultural lands. Therefore they were required to move to another source of income. At that time they faced a lot of problems because in ancient time they practiced agricultural activities as their major source of income. As one of the negative impacts of the Uma Oya project they were forced to move to the other sources of income.

Then after the disaster (after the project) agricultural work was decreased. Now only 28% of the agricultural works are there when compared to the case before the project. Most of the agricultural work available is now only available as daily wage activities. 50% of the populations are now engaged in daily wage activities. Some people have managed to move to into the private and government sectors.

According to the information about who was living in area affected by the project, their cultural background their value system all of the things collapsed. In traditional livelihood times they practice agricultural activities. They take consumed vegetables and other food stuffs from their garden. They had a self-sustaining economy. They never had to go to markets to buy vegetables as they were depending on their own agriculture. Significantly now the entire process has been changed due to most of the agricultural land being destroyed. Now most of the farmers are doing daily wages activities, they may be far away when they are needed to help with problems faced by the family. There will be no protection for their family and family problems will be increasing.

## VII. HEALTH AND SANITARY PROBLEMS

The other significant impact of the Uma Oya project is that people happen to face lot of health issues and sanitary problems Due to the lack of water as a result of the project they don't have enough water facilities for their day to day activities. The researcher could be able to highlight these issues according to the data shown previously. 35% of people now suffer from health issues such as continuously suffering from diseases due to the water. 10% of the populations suffer from sanitary problems as they don't have proper water systems for daily activities. 55% of the population faces other problems for gardening and agricultural work.

## VIII. Nature of diseases before and after the project

The researcher found that, spread of diseases before the (project) disaster Was different to now. Fever 45%, 15% dehydration, 12% skin diseases, 28% other diseases. These diseases were found to spreading because of the climatic system and agricultural patens (fever caused by climatic system, skin diseases cause for by agricultural works) After the disaster all of the issues increased. The percentage of people suffering from skin diseases and dehydration increased, because of the water problems. Most people now don't have clean drinking water and also they don't have proper water system for day today activities.

## IX.PSYCHOSOCIAL PROBLEM

According to all the statistics in this area all the things were collapsed. Their major income patens collapsed, houses were damaged lots of subsidence happened and health problems are numerous. People suffer lot with these problems. As a result 60% Of people were found to be suffering from stress and 10% were found to have attempted suicide. 5% of the population had died because of these kinds of problems.

## X.SUBJECTIONS

Sri Lanka has experienced many development projects within the recent past. But when analyzing Sri Lankan development process in terms of multipurpose developing projects it is reflecting Sri Lanka's incapacity for sustainable development. Being a developing country Sri Lanka should not bear a totally dismissive approach to mega development projects. Instead it should seek to minimize or eliminate the adverse impacts of mega projects by careful planning and designing. At the same time the lessons from past mistakes should be taken as good examples for future development projects by practicing eco-friendly development mechanisms. Finally, the Researcher makes the following recommendations for upcoming development projects in Sri Lanka.

A more detailed study should be carried out to come to a definitive conclusion on the economic and environmental feasibility of mega projects without rushing to conclusions with inconclusive technical evidence.

The decision makers should adhere to the well-defined laws and regulations in the country.

Public participation in terms of professional hearing for the major projects should be made compulsory.

Preparation of EIA reports should not be limited to local specialists but foreign firms should be invited for this purpose as well. It may be argued that the amount which has to be paid for foreign EIA Reports is high, but it should be noted that the sums which have to be spent to repair the economic and social damages following poor project implementations is far higher than this. This step will encourage precautionary approach as well.

For major developments projects especially multi-purpose projects in Sri Lanka; the Project Approving Agency should be Parliament.

Strict conditions should be imposed while implementing such projects; for instance, the cutting down of trees to implement the project should be reduced to a maximum of 2% and none of the streams should be left without cover.

The mega development projects should be carried out within the sphere of sustainable development. Mere development will not achieve proper development in any country, development and sustainable development should be parallel aims line which should not override each other.

It is not possible to control environmental pollution effectively by only applying sustainable development concepts and statutory laws. It is also not possible for the National Environmental Authority to control pollution without the active participation of people. Active participation of the people in the process of implementing national programs on conservation of environment is absolutely necessary.

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# **Session of the Interdisciplinary Research**

# Non-English major undergraduate students' perception towards using English songs in foreign language classroom: A case of Thai–Nichi institute of technology

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## Abstract

The purposes of this research were as follows 1) To investigate the attitude of Thai undergraduates who were not in an English major course towards using English songs in foreign language classroom at Thai-Nichi Institute of Technology (TNI) and 2) to identify the students' perception towards the impacts of using English songs in foreign language classroom at Thai-Nichi Institute of Technology. The samples that were selected were 30 first year students who studied an English Foundation course and came from different faculties at TNI in the first semester of the academic year 2018. All of students selected for the study were non-English major students. They were selected by purposive sampling based on the class assigned for the researcher by the university registrar's office. The data was collected through a survey questionnaire. The results of the research indicated that the students regarded English songs as a fun activity. The findings showed that they were relieved of unnecessary anxiety during the singing activities. In addition, it was found that they were interested in learning English songs and their learning motivation increased after engaging in this teaching activity. Last but not least, they also felt that their English abilities, especially listening ability, improved after learning English through songs.

**Keyword:** English songs, non-English major undergraduate students, EFL Teaching-Learning Approach

## I. INTRODUCTION

Today, English is known to be the world's only international language and will become the language of Asia for business or just communication between countries. Proficiency in the English language can be the key to success for an individual. By being comfortable with the English language, a non-native speaker will have a greater chance of getting a good position in an international organization, doing business with other countries, meeting new people or just traveling because it is the only language used for international communication. However, if they cannot use English well there is often considerably less chance of advancement. This can often lead to struggle for that person to try to rapidly improve their English skills later on.

Many Thais choose English songs to improve Their English proficiency because songs are a key component of the whole language. Songs can be used as a learning tool that can be easily accessed as well as used as a medium to relax while gaining knowledge easily. Moreover, English songs are frequently used as a part of a methodology for teaching English in Thailand. According to Murphey, [1] songs are worth taking into consideration in the language – learning environment because of the wide variety of ways we can exploit them. Griffiee [2] also listed such activities as listening, humming, or tapping along during or after listening, talking and reading about them (the lyrics, ideas, music, artist), playing them to create atmosphere or for background, and creating associations. This wide range of techniques doesn't only help memorization of grammar and new vocabulary that we hear in songs but can also motivate learners to become more receptive to the language.

Even though many have claimed motivational benefits of learning from English songs, few empirical studies have been conducted. This is especially the case for using of English

songs at university level. The purpose of this study is to examine the overall attitude of Thai university students towards using English songs in the English learning classroom at Thai – Nichi Institute of Technology. Additionally, this study attempts to identify the students' perception towards using songs in English class at Thai–Nichi Institute of Technology.

## II. RESEARCH PURPOSES

The purposes of this research are

- 1) To investigate attitude of Thai undergraduates (not in an English major course) towards using songs in English language classroom at Thai-Nichi Institute of Technology.
- 2) To identify the students' perception towards the impacts of using English songs in class at Thai-Nichi Institute of Technology.

## III. RESEARCH METHODOLOGY

### A. Research Design

The present study aimed to identify the overall attitude of Thai university students towards the use of English songs in the English classroom at Thai–Nichi Institute of Technology. It also aimed to identify students' perception towards the use of English songs in class. The study adopted the quantitative research design in order to achieve its objectives. Nunan [3] stated that the methods used to collect vast numbers of data or, in fact, anything that can be measured is called quantitative research. This type of research is valuable in allowing us to summarize and compare large amounts of data with other material or research.

### B. Participants

The population of the study was undergraduate students at Thai–Nichi Institute of Technology. The samples



were 30 first year students who studied an English Foundation Course and came from different faculties at TNI in the first semester of the academic year 2018. All of them were non - English major students and they were selected by purposive sampling based on the class assigned for the researcher by the university registrar's office.

### C. Instrumentation

The instrument used in this study was a questionnaire. It was developed by the researcher and based on students' perception towards using English songs in foreign language classroom. Part 1 of the questionnaire asks for students' attitude towards using English songs in their English lessons. Part 2 deals with students' perception towards the impacts of using English songs in their English lessons. Apart from this, no particular parameter such as age, group and gender was collected.

### D. Research Procedure

#### Teaching steps

The procedure used for the teaching of songs was adapted from Simpson [4]. The teaching steps were divided into five consisting of (1) listening to the song, (2) asking some questions about title, (3) listening to the song again, this time with lyrics, (4) focusing on a particular verb tense or aspect of grammar, (5) focusing on vocabulary, idioms and expressions, each of which is detailed as follows:

#### (1) Listening to the song

The first step involves the establishment of background knowledge concerning a song which students are required to engage in. It is important to remember that this step should not be serious or boring. As an alternative, a video clip can be used to encourage students' participation, as it will cater to more learners' learning preferences.

#### (2) Asking some questions about title

The questions are employed to encourage students' interaction. For Queen's classic "We are the champions": "What is a champion?", "What kind of champions are there in the world?", "What activities have champions? Such questions tend to work really well as conversation starters, so three or four learners can be grouped together and then feedback can be received from each group on their thoughts.

#### (3) Listening to the song again, this time with lyrics

This time, the lyrics to the song are given to the students to read. Students can read the lyrics while they listen to the song. They can highlight unknown words for later discussion.

#### (4) Focusing on a particular verb tense or aspect of grammar

Virtually, every song centers on a particular verb tense. This is a good opportunity to pass up in term of uncovering the grammar. The questioning techniques are used to encourage students' participation. Examples of questions are as follows: "How many examples can you find of the past simple tense in the lyrics?", "Why did the writer of this song choose this verb tense?" This acts as a springboard for discussing the function of a specific tense, as well as examining its form. Moreover, it often tends to raise awareness of the construction of song lyrics.

#### (5) Focusing on vocabulary, idioms and expressions

It is also useful to focus on the creative and artistic use of vocabulary we encounter in lyrics. The questions are used again. Start with questions like these (for Queen's classic song "We are the champions"): What does "I've paid my dues" mean? What does "my share of" mean? Go through the meanings, illustrating with other examples if necessary. Songs often serve as really good contexts for phrase and idioms, but it is good to make sure that the meaning is clear.

The four English songs were used as the supplemental materials to their English textbook, the instructional time was intermittent. That is, each song was introduced after the end of one lesson. On average, 15 minutes per period were reserved for one English song and the students had two class periods per week. The students were exposed to the song 30 minutes a week for three continuous weeks. To sum up, there was a total of six-hour instructional time within 12 weeks.

### E. Data collection Method

The data was collected from a survey questionnaire administered to the participating students. The 18-item questionnaire was constructed and administered during the last class of the semester. The purpose of the questionnaire was to elicit learners' attitude and perception towards using English songs in their foreign language classroom.

### F. Data Analysis

Data obtained through the questionnaire was analyzed using descriptive statistics of frequency and percentage.

## IV. RESULTS

There were two objectives in this study:

1. To investigate the students' attitude of Thai undergraduates (not in an English major course) towards using songs in English language class at Thai-Nichi Institute of Technology.

The results obtained from this study revealed students' attitude towards using English songs in their English lessons. The table below demonstrates the frequency and percentage of the variables of students' attitude towards using English songs in their English lessons (see table 1).

As shown in table 1, the results revealed that according to the variables in the table: item 2 indicated the highest percentage of 96.6%. It showed that the students agreed to the statement "Using English songs for this English course is fun." Followed by items number 3 and number 6 which has the same percentage of 93.3%, they showed that students felt that the use of songs in the classroom could help to improve their listening skills and increase their desire to improve in English skills. Item number 4 indicated the third highest percentage of 90%. 27 of the 30 participants chose the statement "I am confident that I can learn the vocabulary and sentences in the lyrics." Finally, item number 8 indicated the fourth highest percentage of 86.6%. It proved that the students believed that learning English through songs was not difficult.

2. To identify the students' perception towards the impacts of using songs in their English lessons at Thai-Nichi Institute of Technology.

The results obtained revealed the students' perception towards using songs in their English lessons at Thai-Nichi Institute of Technology. The table below demonstrates the

frequency and percentage of the variables for students' perception towards the impacts of using songs in their English lessons (see Table 2).

TABLE I. THE RESULTS OF STUDENTS' ATTITUDE TOWARDS USING ENGLISH SONGS IN THEIR ENGLISH LESSONS

Item No.	Variables	Frequency	Percentage
1.	Using English songs in the classroom give me an eagerness to learn English.	25	83.3%
2.	Using English songs for this English course is fun.	29	96.6%
3.	I think that the use of English songs in the classroom is a good way to consolidate and improve listening skills.	28	93.3%
4.	I am confident that I can learn the vocabulary and sentences in the lyrics.	27	90%
5.	When English songs are used in the classroom, I prefer to do a given exercise in a group.	24	80%
6.	Using English songs in the classroom has increased my desire to improve English skills.	28	93.3%
7.	Using English songs give me the motivation to focus on songs outside of the classroom.	25	83.3%
8.	I think learning English through songs is easier than learning from the textbook.	26	86.6%
9.	Using English songs in the classroom have resulted in me singing along to song more accurately.	24	80%
10.	Overall, I really enjoy my English Foundation course this semester.	25	83.3%

As shown in table 2, generally the students agreed that songs have a positive impact on their language learning. According to the variables in the table, item number 5 and 8 had the highest percentage of 96.6%. They showed that the students perceived their anxieties could be markedly lowered in such an encouraging and non-threatening atmosphere. Moreover, they felt relaxed when learning English through songs. Item number 1 and 2 indicated the second highest percentage of 93.3%. They showed that the students agreed with the use of English songs in the English classroom because they felt songs helped to improve their listening skills. Furthermore, they believed that their pronunciation of English words was improved. Item number 3 indicated the third highest percentage of 90% as 27 out of 30 chose the statement "I do not panic anymore if I listen to English from various sources." For this statement, the students agreed that songs were very helpful to overcome their stresses when they had to

listen to English language from various sources. Finally, item number 7 indicated the fourth highest percentage of 86.6%. It proved that songs could boost their confidence in listening to their English lectures.

TABLE II. THE RESULTS OF STUDENTS' PERCEPTION TOWARDS THE IMPACTS OF USING SONGS IN THEIR ENGLISH LESSONS

Item No.	Variables	Frequency	Percentage
1.	I feel my listening skill is better after using songs in the classroom.	28	93.3%
2.	My pronunciation of English words has also improved.	28	93.3%
3.	I do not panic anymore if I listen to English from various sources.	27	90%
4.	I do not feel my heart pounding anymore when I have to take English listening tests.	25	83.3%
5.	I feel relaxed when learning English through songs.	29	96.6%
6.	I feel English songs are useful for my English learning and my language skills.	25	83.3%
7.	Even with no preparation, I do not panic when I am required to listen to my English lecture.	26	86.6%
8.	Learning English through songs does not cause me stress.	29	96.6%

## V. DISCUSSION AND CONCLUSION

The findings obtained from the survey showed that TNI students had a positive experience with the use of English songs in their language classroom. The researcher found that overall class motivation had significantly increased after using English songs as a tool of teaching in the classroom. Students were motivated to become more active learners. According to students' responses, it could be elicited that most students were fond of learning English through songs. It was also important to note that students felt that their English abilities had improved after learning English songs. This result was supported by Edge [5] who stated that the more students enjoy language skills, the more language ability they are likely to acquire. In addition, by engaging in English songs in the classroom, the students believed that their anxiety levels were reduced. A reduction in the level of anxiety in the classroom leads to improved levels of self-confidence. This result was similar to Brown [6] who agreed that confidence can be promoted through experience with success and the reduction of anxiety. Therefore, rather than being considered as separate, marginal items, English songs could be valuable materials to be integrated into language classroom.

## ACKNOWLEDGMENT

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# A study of EFL learners' satisfaction towards online learning

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## Abstract

The purposes of this research were 1) to study EFL Learners' Satisfaction towards Online Learning and 2) to gather supplemental suggestions. Research samples were 234 Thai-Nichi Institute of Technology (TNI) students in the first semester of the 2018 academic year. The sample was derived through the simple random sampling technique. The instruments used for gathering the data were the rating-scale questions and open-ended questions delivered in the form of a questionnaire. The statistics used for analyzing the data were frequency, percentage, mean, standard deviation, and content analysis.

The research findings were as follows: 1) The percentages of TNI undergraduate respondents in genders were 53.8% male and 46.2% female; classified by faculties Business Administration 67.9% , and 32.1% Information Technology. 2) TNI students high level of EFL Learners' display Satisfaction towards Online Learning in overall ( $=4.11$ ). When considered each aspect, it was found that the students had a high level of Online learning lesson design, Online learning activities, Online learning content and Online learning usage ( $=4.31$ ,  $=4.24$ ,  $=4.15$  and  $=3.75$ ) respectively. 3) TNI students had supplemental suggestions about online learning as following: The content should be concise, interesting and easy to understand. Moreover, the lessons should be easily accessed. The instructor should provide learners more chances for asking the questions. Additionally, the activities should be various and motivational to the learners to learn more.

**Keyword:** EFL Learners, satisfaction, online learning

## I. INTRODUCTION

Nowadays, English language is crucial for people in society, especially undergraduate students who will work after graduation. English is the dominant or official language used by people in more than 60 countries on every continent [1]. English language and internet work together for raising the students' capability. Internet tools can benefit and improve educational processes and foster the use of technology in language classrooms [2]. In the 2010-11 academic year, 89 percent of four-year colleges and universities offered courses taught fully online, or hybrid/blended online or other forms of distance/non-face-to-face instruction [3]. Furthermore, Distance education originated in the United States in the 1800 when teachers and learners at the University of Chicago at different locations tried to connect through correspondence programs [4]. Internet has made online learning beneficial for the learners. Online learning can enhance and improve student learning outcomes while compensating the reduction in resources, particularly in higher education [5].

Thai-Nichi Institute of Technology recognizes the efficiency of online learning. Therefore, online learning has been promoted to the students. As a result, studying the EFL Learners' Satisfaction towards Online Learning can develop the learners' potential. The researchers expected that EFL learners can develop English language skills or proficiency through online learning.

## II. RESEARCH PURPOSES

The purposes of this research were

- 1) *To study EFL Learners' Satisfaction towards Online Learning*

- 2) To gather supplemental suggestions

## III. RESEARCH METHODOLOGY

### A. Population and Samples

Population of this research was 1,200 TNI students in 2 faculties of Information Technology and Business Administration in the first semester of 2018 academic year. Samples of the research were 234 TNI students derived through simple random sampling technique. The instruments used for gathering the data were rating-scale and open-ended questionnaire. The statistics used for analyzing data were frequency, percentage, mean, standard deviation, and content analysis.

### B. Instrumentation

The instrument used in this study is a questionnaire constructed by the researcher.

Part 1 of this questionnaire asks for demographic information such as genders and faculty.

Part 2 focus on EFL Learners' Satisfaction towards Online Learning. This part comprises 35 items of students' opinion about EFL Learners' Satisfaction towards Online Learning in 4 major areas: 10 items of Online learning usage, 10 items of Content, 10 items of Lesson design, and 5 items of Activities.

The five levels of Learners' Satisfaction towards Online Learning used in the questionnaire are "The Highest", "High", "Moderate", "Low" and "Lowest". Responses from the student questionnaires were subsequently coded. The data of the students' coded responses were statistically calculated and analyzed. The computation of Cronbach's Alpha as a measure of reliability was employed to indicate how reliable the research questionnaire results were. Reliability is defined as

the proportion of the students' responses to each item in the questionnaire and the reliability coefficient or calculated alpha is a lower bound of the reliability of the research instrument, or the questionnaire. The descriptive statistics is also used to determine the individual summary statistics for each of the 35 items in the questionnaire.

The third part (Part 3) asks for more opinions and suggestions of EFL Learners' Satisfaction towards Online Learning which based on open-ended questions.

### C. Data Analysis

Data analysis from questionnaire both single item and whole questionnaire which presented a form of rating scale. These rating scales were calculated to find out mean and standard deviation then translated based on following criteria (adapted from Thaweerat, 2000: 107-108)

4.51 - 5.00 refers to TNI students had the highest level of satisfaction towards Online Learning

3.51 - 4.50 refers to TNI students had high level of satisfaction towards Online Learning

2.51 - 3.50 refers to TNI students had moderate level of satisfaction towards Online Learning

1.51 - 2.50 refers to TNI students had low level of satisfaction towards Online Learning

1.00 - 1.50 refers to TNI students had the lowest level of satisfaction towards Online Learning

## IV. RESULTS

### A. Part 1 The results of demographic variable of TNI undergraduate students

The analysis of the data from the students' questionnaire reported by TNI undergraduate students in the 2018 academic year presented in 2 section deals with the demographic variables from the students' responses to Part 1 of the questionnaire: genders, academic years and faculties as following table.

TABLE I. TABLE OF THE RESULTS OF DEMOGRAPHIC DATA OF RESPONDENTS

Demographic data of respondents	N=234	Percentage
<b>1. Genders</b>		
1.1 Male	126	53.8
1.2 Female	108	46.2
<b>Total</b>	<b>234</b>	<b>100</b>
<b>2. Faculties</b>		
Information Technology	75	32.1
Business Administration	159	67.9
<b>Total</b>	<b>234</b>	<b>100</b>

Table showed that percentages of TNI undergraduate respondents in genders were 53.8% male and 46.2% female; as classified by faculty affiliation 67.9% Business Administration and 32.1% Information Technology.

### B. Phase 2 EFL Learners' Satisfaction towards Online Learning

TABLE II. TABLE OF MEAN AND STANDARD DEVIATION OF EFL LEARNERS' SATISFACTION TOWARDS ONLINE LEARNING IN TOTAL

Components	$\bar{x}$	S.D.	Level
1. Online learning usage	3.75	.99	High
2. Online learning content	4.15	.81	High
3. Online learning lesson design	4.31	.81	High
4. Online learning activities	4.24	.83	High
<b>Total</b>	<b>4.11</b>	<b>.86</b>	<b>High</b>

The table above indicated that TNI students had a high level of EFL Learners' Satisfaction towards Online Learning overall ( $\bar{x}$ =4.11). When considered in each aspect, it was found that students had a high level of satisfaction for Online learning lesson design, Online learning activities, Online learning content, and Online learning usage ( $\bar{x}$ =4.31,  $\bar{x}$ =4.24,  $\bar{x}$ =4.15 and  $\bar{x}$ =3.75) respectively.

TABLE III. TABLE OF MEAN AND STANDARD DEVIATION OF EFL LEARNERS' SATISFACTION TOWARDS ONLINE LEARNING IN USAGE

Components	N	$\bar{x}$	S.D.	Level
1. Online learning causes less interaction between learner and instructor.	234	3.53	1.07	high
2. Online learning causes less interaction between learner and classmate.	234	3.32	1.23	moderate
3. Online learning helps learner save time for learning.	234	4.09	0.91	high
4. Online learning motivates learner to be curious about learning lessons.	234	3.33	1.04	moderate
5. Online learning motivates learner to review the lessons more often.	234	3.35	1.05	moderate
6. Online learning should be interesting.	234	4.23	0.89	high
7. Online learning makes the learners have fun.	234	3.62	1.05	high
8. Online learning helps learners study the lessons repeatedly when they don't understand.	234	4.42	0.80	high
9. Online learning helps learners get better grade.	234	3.57	0.95	high
10. Online learning helps learners save cost and reduce using paper.	234	4.07	0.98	high
<b>Total</b>	<b>234</b>	<b>3.75</b>	<b>0.99</b>	<b>high</b>

The table showed that online learning usage overall was at high level ( $\bar{x}$ =3.75). The item which ranked the highest mean score at high level was item 8 Online learning helps learners study the lessons repeatedly when they don't understand. ( $\bar{x}$ =4.42), followed by item 6 Online learning should be interesting. ( $\bar{x}$ =4.23). However, the lowest mean score at moderate level was item 2 Online learning causes less interaction between learner and classmate. ( $\bar{x}$ =3.32).

TABLE IV. TABLE OF MEAN AND STANDARD DEVIATION OF EFL LEARNERS' SATISFACTION TOWARDS ONLINE LEARNING IN CONTENT

Components	N	$\bar{x}$	S.D.	Level
1. The purpose of online learning content should be identified at the beginning.	234	4.36	0.77	high
2. Online learning content helps learner understand the lessons more.	234	3.90	0.89	high
3. Online learning content helps learner understand the lessons by himself.	234	3.98	0.84	high
4. Online learning content helps learner remember the important information more.	234	3.79	0.87	high
5. End of lesson exercise helps learner understand the lessons more.	234	3.89	0.83	high
6. Online learning content should be started from easy to difficult content.	234	4.41	0.71	high
7. Online learning content should be clear and easy to understand.	234	4.44	0.80	high
8. Online learning content should fulfill the difference of learner.	234	4.32	0.74	high
9. Online learning content should cover main issues.	234	4.36	0.77	high
10. Online learning content helps learner achieve study goal.	234	4.02	0.84	high
<b>Total</b>	<b>234</b>	<b>4.15</b>	<b>0.81</b>	<b>high</b>

The table showed that content in overall was at high level ( $\bar{x}$ =4.15). The item which ranked the highest mean score at high level was item 7 Online learning content should be clear and easy to understand. ( $\bar{x}$ =4.4), followed by item 6 Online learning content should be started from easy to difficult content. ( $\bar{x}$ =4.41). However, the lowest mean score at high level was item 5 End of lesson exercise helps learner understand the lessons more. ( $\bar{x}$ =3.89).

TABLE V. TABLE OF MEAN AND STANDARD DEVIATION OF EFL LEARNERS' SATISFACTION TOWARDS ONLINE LEARNING IN DESIGN

Components	N	$\bar{x}$	S.D.	Level
1. The design of main menu should be easy to understand and easily access.	234	4.38	0.76	high
2. The design has an effect on learner's understanding.	234	4.35	0.76	high
3. Font's color and size are important for lesson design.	234	4.41	0.76	high
4. Slide or animation are important for lesson design.	234	4.29	0.85	high
5. The lesson length should be concise.	234	4.39	0.82	high
6. Sound design is important for lesson design.	234	4.37	0.79	high
7. Musical accompaniment is important for lesson design.	234	3.86	0.99	high
8. Symbol in online learning should be clear, not complicated.	234	4.34	0.77	high
9. Online learning access should be quickly reached.	234	4.39	0.77	high
10. Communication channels of online lesson should be more provided between instructor and learner, learner and learner.	234	4.32	0.81	high
<b>Total</b>	<b>234</b>	<b>4.31</b>	<b>0.81</b>	<b>high</b>

The table showed that design in overall was at high level ( $\bar{x}$ =4.31). The item which ranked the highest mean score at high level was item 3 Font's color and size are important for lesson design. ( $\bar{x}$ =4.41), followed by item 5 The lesson length should be concise. ( $\bar{x}$ =4.39) and item 9 Online learning access should be quickly reached. ( $\bar{x}$ =4.39). However, the lowest mean score at high level was item 7 Musical accompaniment is important for lesson design. ( $\bar{x}$ =3.86).

TABLE VI. TABLE OF MEAN AND STANDARD DEVIATION OF EFL LEARNERS' SATISFACTION TOWARDS ONLINE LEARNING IN ACTIVITIES

Components	N	$\bar{x}$	S.D.	Level
1. Online learning activities should be suitable, not too much or too little.	234	4.26	0.82	high
2. Online learning activities should be various.	234	4.26	0.83	high
3. Online learning activities should be complied with lessons.	234	4.40	0.75	high
4. Online learning activities should be suitable for learner's level.	234	4.28	0.76	high
5. Online learning activities motivate learner to learn more.	234	3.98	0.97	high
<b>Total</b>	<b>234</b>	<b>4.24</b>	<b>0.83</b>	<b>high</b>

The table showed that activities in overall was at high level ( $\bar{x}$ =4.24). The item which ranked the highest mean score at high level was item 3 Online learning activities should be complied with lessons. ( $\bar{x}$ =4.40), followed by item 4 Online learning activities should be suitable for learner's level. ( $\bar{x}$ =4.28). However, the lowest mean score at high level was item 5 Online learning activities motivate learner to learn more. ( $\bar{x}$ =3.98).

### C. Phase 3 The results of opinions and suggestions of EFL Learners' Satisfaction towards Online Learning

Opinions and Suggestions	N	Fre	Percentage
<b>EFL Learners' Satisfaction towards Online Learning</b>	<b>65</b>		<b>100</b>
1. The content should be interesting and attract the learners' interest.	65	24	36.92
2. The content should be concise, sort the content from easy part to difficult part.	65	16	24.61
3. The activities should be various and motivate the learners to learn more.	65	12	18.47
4. The instructor should communicate with the learners and provide communication channels for asking the questions.	65	10	15.38
5. The lessons should be easily accessed	65	3	4.62

The table showed that TNI students had opinions and suggestions about satisfaction towards online learning as following:

Opinions and suggestions from 65 students were, The content should be interesting and attract the learners' interest 36.92% (24 students); The content should be concise, sort the content from easy to difficult 24.61% (16 students); The activities should be various and motivate the learners to learn

more 18.47% (12 students); The instructor should communicate with the learners and provide communication channels for asking the questions 15.38% (10 students); The lessons should be easily accessed 4.62% (3 students).

## V. DISCUSSION AND CONCLUSION

### Conclusions

According to the study and data analysis, the results of this study were concluded as follows:

1. TNI undergraduate respondents in genders were 53.8% male and 46.2% female; their faculties were 67.9% Business Administration and 32.1% Information Technology.

2. TNI students expressed high level of EFL Learners' Satisfaction towards Online Learning in overall ( $\bar{x}$ =4.11). When considered in each aspect, it was found that the students had a high level of Online learning lesson design, Online learning activities, Online learning content, and Online learning usage ( $\bar{x}$ =4.31,  $\bar{x}$ =4.24,  $\bar{x}$ =4.15 and  $\bar{x}$ =3.75) respectively.

3. TNI students made recommendations about online learning as following:

3.1 The content should be concise, interesting and easy to understand.

3.2 The lessons should be easily accessible.

3.3 The instructor should provide learners more opportunities for asking the questions.

3.4 The activities should be various and motivate the learners to learn more.

### Discussions

TNI students had a high level of EFL Learners' Satisfaction towards Online Learning in overall. This might be because online learning can motivate the students' interest and enhance English language knowledge of the students. This is supported by Farinella, Hobbs, & Weeks, 2000; Kim & Bonk, 2006; Pape, 2010 who claimed that online learning can enhance and improve student learning outcomes while combating the reduction in resources, particularly in higher education

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# Mathematics teaching in basic education in Thailand by integrating STEM-waldorf technique to increase students' achievement and inspiration in learning

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## Abstract

This study aimed to analyze the results of integrating two innovations in teaching mathematics in basic education in Thailand. These were STEM education and Waldorf education. A quantitative method was used by integrating both innovations into the “STEM-Waldorf technique”. In this study, the researcher employed a semi structured interviews in an action research approach. The area of the research was the Omnoi Sophonchanupatham School, Samut Sakhon, Thailand. The populations used for this study were the students in Matthayom 2 (Grade 8) in the first semester of the academic year 2018. The number of students was 180. The samples were from 4 classes; Matthayom 2/2, 2/4, 2/6 and 2/8. Once the students were selected the researcher used cluster random sampling to group students into two groups. The first group was the experimental group. This included 90 students from Matthayom 2/2 and 2/8. The other group was the control group. These were the remaining 90 students from Matthayom 2/4 and 2/6.

The research instruments that were used for the study were as follows; pretest and posttest assessments, Ratio and Percentage subject lessons, a STEM activity named “Powerful Stage”, and a satisfaction questionnaire to gather their responses from learning using the STEM-Waldorf technique. The basic statistics that were used to analyze the data were arithmetic mean, standard deviation and t-test. The research findings were as follows. (1) The experimental group score was higher than the control group. (2) The students who were taught using the STEM-Waldorf technique had higher arithmetic mean results at a 0.01 statistical significance level. In addition to this they had higher satisfaction in learning inspiration from learning with STEM-Waldorf technique.

**Keyword:** mathematics teaching, STEM-Waldorf technique, learning inspiration

## I. DEFINITIONS

*Basic education* means education prior higher education. It can be divided into three levels; kindergarten, primary, and secondary.

*Educational institutes* are a place set for learning and training. There are many names of them such as school, institute, college, university, center, etc.

The *STEM-Waldorf technique* integrates STEM education and Waldorf education techniques for teaching and learning mathematics in basic education.

*Learning achievement tests* are the tests which the researcher developed in order to assess the proficiency, understanding, memory, critical thinking, and adapting some knowledge from STEM activities to be used.

*Learning outcome* means the intellectual ability which is developed by the student through STEM-Waldorf technique. This is measured using the achievement test.

An *experimental group* means the research sample group who was taught with STEM-Waldorf technique for the study.

A *control group* means a research sample group who was taught with the conventional technique.

## II. INTRODUCTION

STEM education is an innovation focusing on integrating science, technology, engineering, and mathematics. The Institute for the Promotion of Teaching Science and Technology (IPST), Ministry of Education of Thailand,

presents a definition of STEM which states it is “integrating four fields of knowledge in living and working”.

To sum up, the book named “STEM Basic Knowledge” [5] concluded the usefulness of using STEM into five key areas; 1) learners have critical thinking and new innovation using science, technology, and engineering processes, 2) learners understand content and scientific and mathematics process more, 3) STEM supports learning and integration among subjects, 4) government agencies & state enterprises collaborate teachers' activities, and 5) developing people in STEM in Thailand will help the economy to grow.

Waldorf education is the innovation of integrating content and activities together while using teachers as facilitators. It focuses on classroom atmosphere inside and outside the classroom in order to inspire students' learning and also develop students' personality with nature. Moreover, it can pull out every potential learning opportunity within an appropriately educational institute context.

For Thailand, the information showed that Waldorf education technique has been used at kindergarten and special education center level. The Master's thesis entitled “Development of Arts Creative Thinking of Early Childhood Children Using the Waldorf Learning Experience Model” was made to compare creative thinking of early childhood children. The results showed that the posttest score was higher than the pretest at the 0.01 statistical significance level. [2]

At the time of this research there were no primary or secondary schools in Thailand using the Waldorf education



technique in teaching and learning. However, STEM education is used in basic education according to the policy of Office of the Basic Education Commission, Ministry of Education.

Rudolf Steiner, a German philosopher, created Waldorf learning management. He believed that the better the atmosphere, the better the learning. Therefore, inside and outside classroom management with Waldorf education helps learners to grow up and blend with the environment. Also, learners develop physical, mental matter, and potential. Learners' learning will be balanced including body (practice), heart (feeling, impression), and brain (thinking). [4]

There are many educational institutes in Thailand that face a problem with environment and atmosphere in the classroom. For example, it can be seen in the photo below that there are a lot of students in one class and the reflection of whiteboard in class is affecting their vision and learning management efficiency. (See Fig. 1)



Fig. 1. The reflection of whiteboard in class.

As a result of these problems, learning management in class affected the efficiency of the learning. This affected the researcher too in integrating between learning management with Waldorf education and STEM education in order to solve the problems and build up some inspiration for students within the name "STEM-Waldorf technique".

Amarin Apirakmas said in his academic article entitled "STEM Education for Mathematics Teaching in Basic Education with Smiling Face Learning", that the paradigm and learning management in the mathematics subject related to the context of learners and education as follows; 1) change learning style; 2) adjust teaching method; 3) input guiding data; 4) build inspiration; 5) challenge idea. These strategies aim to increase learning achievement, as well as smiling and happiness in learning of the teacher and the learners. [1]

Learning management with STEM-Waldorf technique is learning management with STEM education integrated the knowledge of science, technology, engineering, and mathematics within good environment and atmosphere. Learners can feel relaxed and not focus too much on the content. Moreover, there are some smiles between teachers and students and decreasing some students' stresses. This is shown in Fig. 2.



Fig. 2. Learning management outside the classroom to create the learning environment.

Learning management with STEM-Waldorf technique can be set up as a camp which is suitable for the Thai context as shown in Fig. 3. The research titled "Pattern Development for Mathematics by Action Research" concluded that the mathematics camp can help students to practice work planning, teamwork, collaboration, helping each other, and listening to others. [3]



Fig. 3. Smile making through learning management outside the classroom.

In this project, the researcher integrated the processes and strategies in the learning management, Waldorf education and Amarin Apirakmas' five strategies in STEM education as stated. The purposes are to increase learning achievement, smile, and happiness between the teachers and the learners. The researcher hopes that learners who learnt with STEM-Waldorf technique had higher learning achievement and inspiration than students who learnt with the conventional technique.

### III. OBJECTIVES

The objectives of this study were to study the results of integrating two innovations in Educations. There were STEM education and Waldorf education. This was done in the hope that it would increase learning achievement in the mathematics subject at the basic education level. The content of this study was in the Mathematics subject area of ratios and percentages. This was carried out in basic mathematics for Matthayom 2 students according to the Basic Education Core Curriculum B.E. 2551 (A.D. 2008).

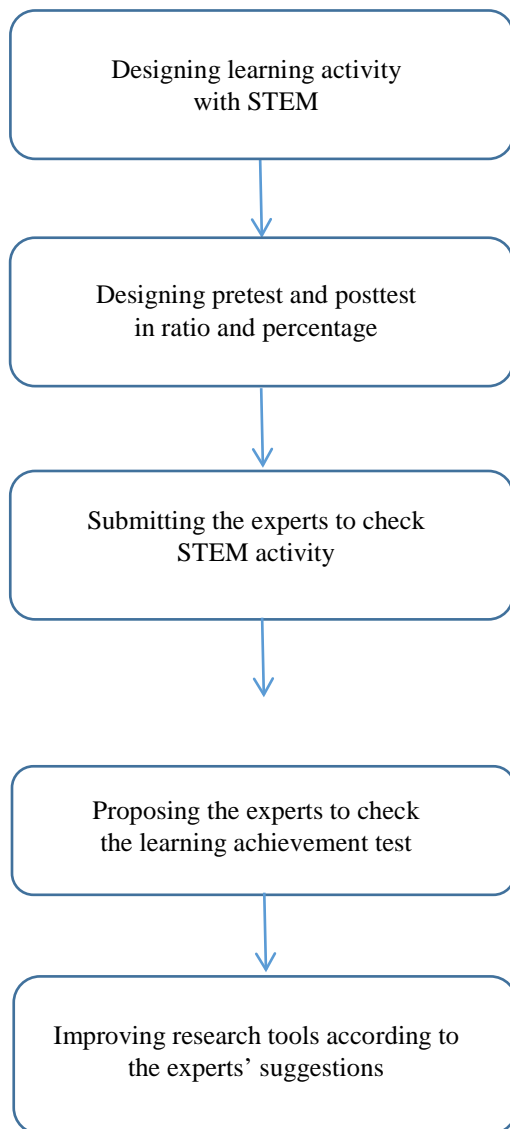
#### IV. RESEARCH METHODOLOGY

This study was semi-action research. It is employed two concepts; learning management with STEM education and good atmosphere and environment. It affected students' minds and built up some inspiration related to Waldorf education and the concept of a mathematics camp. [3]

The population of this study was Matthayom 2 students at Omnoi Sophonchanupatham School, Samut Sakhon, Thailand. All 180s students were in the first semester of the academic year 2018. They separated into two groups of equal size. The first group was the experimental group who learnt using the STEM-Waldorf technique. The other half were the control group who learnt by normal techniques.

In this study, the researcher separated the research process into three steps as follows.

##### A. Instrument Development



The main research instrument was “Powerful Stage” activity. This was from “Powerful Scaffold” activity in primary level developed by IPST and adapted with learning management in secondary level (see Fig. 4).

Class \_\_\_\_\_ Group No \_\_\_\_\_

POWERFUL STAGE

*Omnoi Sophonchanupatham School has many useless spaces. The school director has some policy in using those spaces to create the best student stage. The students who are responsible have to make the stage which can be gained as many people as they can. They have to use the limited spaces and materials worthily.*

**\* Tasks**

You have to design in a way of engineer with mathematics knowledge or any related knowledge and make the stage from the given materials. The stage have to be strong and gain as many weights as.

**Materials:** 1. spaghetti 2. hot glue 3. feature board

Designing the stage

Fig. 4. Powerful Stage worksheet (the original was in Thai).

The process in this step was separated by samples' basic knowledge with the pretest about ratio and percentage. It can be divided into three levels; A, B and C. (see Table I.)

TABLE I. THE CRITERIA OF SEPARATING STUDENTS' MATHEMATICS BASIC KNOWLEDGE

PERCENTAGE	LEVELS
FROM 80 TO 100	<b>A</b>
FROM 50 BUT LESS THAN 80	<b>B</b>
FROM 0 BUT LESS THAN 50	<b>C</b>

Learning management outside the classroom was used to develop learning atmosphere using a teacher as a facilitator. In addition, it helped to inspire the students as shown in Fig. 5. The work the students' completed in the “Powerful Stage” activity is shown in Fig. 6.

### B. Instrument Test

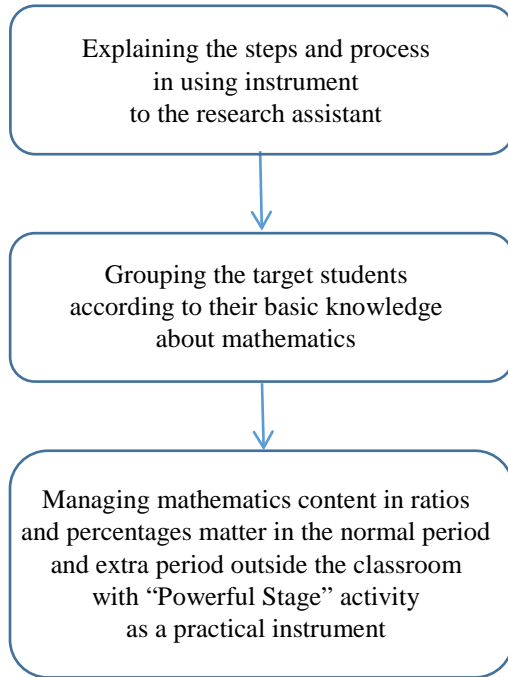
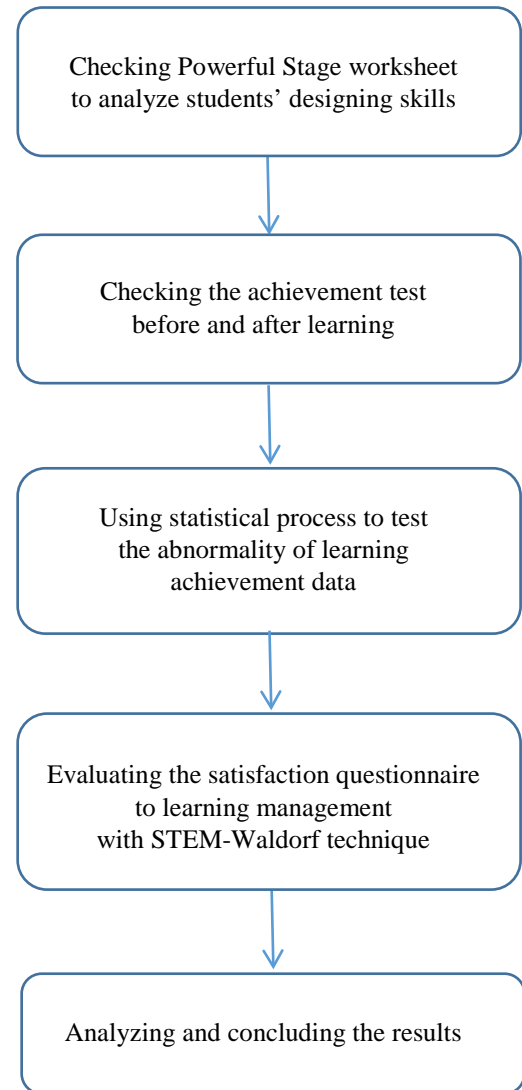


Fig. 5. Learning Management outside the classroom with a teacher as a facilitator.



Fig. 6. Students' works from "Powerful Stage" activity.

### C. Analyzing Data



This step was the evaluation and analysis after finishing the first two steps as shown earlier.

### V. OUTCOME

The tables and graphs as shown below were the results of the study.

From Table II and Graph I, it was found that the number of students in the experimental group at A level was  $N_1=30$ , at B level was  $N_2=36$ , and at C level was  $N_3=21$ . An interesting point of this study was that the students at A level and C level from both groups showed large differences. The students from Class 2/8 had less basic knowledge about mathematics than the students from Class 2/2, however, the students from the control group as shown in Table III and Graph II had no difference in their basic knowledge.



TABLE II. THE NUMBER OF SAMPLES SEPERATED BY BASIC LEVEL BEFORE PRETEST OF THE EXPERIMENTAL GROUP

LEVELS	CLASS	NUMBER OF STUDENTS
A	2/2	32
	2/8	1
B	2/2	16
	2/8	20
C	2/2	0
	2/8	21
<b>TOTAL</b>		90

GRAPH I. THE NUMBER OF SAMPLES SEPERATED BY BASIC LEVEL BEFORE PRETEST OF THE EXPERIMENTAL GROUP

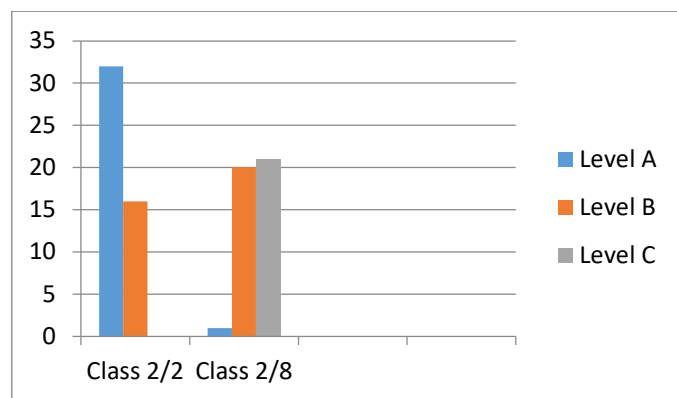
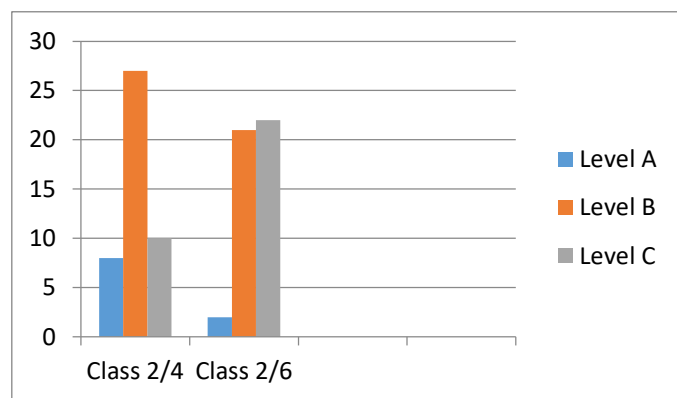


TABLE III. THE NUMBER OF SAMPLES SEPERATED BY BASIC LEVEL BEFORE PRETEST OF CONTROL GROUP

LEVELS	CLASS	NUMBER OF STUDENTS
A	2/4	8
	2/6	2
B	2/4	27
	2/6	21
C	2/4	10
	2/6	22
<b>TOTAL</b>		90

GRAPH II. THE NUMBER OF SAMPLES SEPERATED BY BASIC LEVEL BEFORE PRETEST OF CONTROL GROUP



When separating the students in each class, the teacher divided students into six sub-groups according to the basic level with STEM-Waldorf technique as shown in Table IV.

TABLE IV. THE SEPERATION OF THE EXPERIMENTAL GROUP WITH BASIC LEVEL FOR STEM WALDORF TECHNIQUE LEARNING MANAGEMENT

CLASS	GROUPS	LEVELS	NUMBER OF STUDENTS
2/2	1 – 4	A	8 PER GROUP
	5 – 6	B	8 PER GROUP
2/8	1	A, B	7 PER GROUP
	2 – 3	B	7 PER GROUP
	4 – 6	C	7 PER GROUP

When separating the students as shown in Table IV, after finishing teaching in class, the researcher managed learning with the STEM-Waldorf technique activity as shown in Fig. 7.



Fig. 7. Powerful Stage Activity.

After the “Powerful Stage activity”, tests of students’ work were carried out in the classroom (see Fig. 8).



Fig. 8. The Test of Students’ work in the Experimental Group (Class 2/8 group 4).

After using STEM-Waldorf technique in learning management, it was found that students performed at a high level in every group. Some interesting findings were that students from group 4 in Class 2/8 had the best work when

comparing with other groups. Moreover, students were happy in learning about ratios and percentages when using this method. This inspired some of the students who were at C level and some learning disabled students to be more enthusiastic in learning mathematics.

When finishing the learning management with STEM-Waldorf technique, the researcher tested students with the achievement test about ratio and percentage. It showed the results from the learning management with STEM-Waldorf technique for the experimental group and the learning management with normal technique for the control group were shown in Table V, Graph III, Table VI and Graph IV, respectively, below.

TABLE V. THE RESULTS OF SEPERATION OF POSTTEST OF THE EXPERIMENTAL GROUP WITH STEM-WALDORF TECHNIQUE

LEVELS	CLASS	NUMBER OF STUDENTS
A	2/2	48
	2/8	37
B	2/2	0
	2/8	5
C	2/2	0
	2/8	0
TOTAL		90

GRAPH III. THE RESULTS OF SEPERATION OF POSTTEST OF THE EXPERIMENTAL GROUP WITH STEM-WALDORF TECHNIQUE

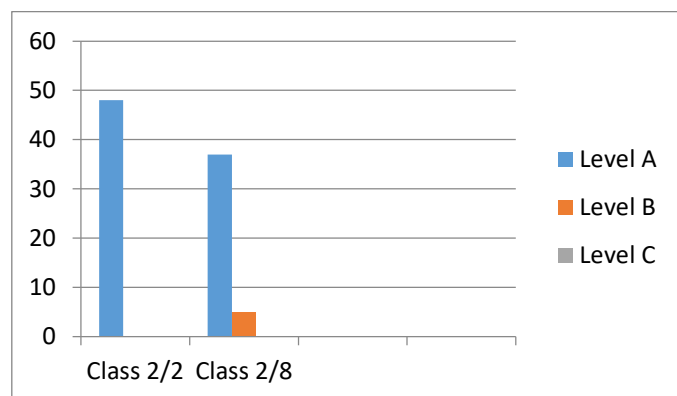
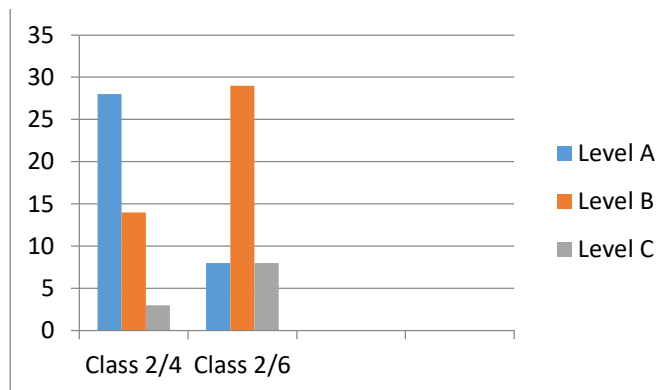


TABLE VI. THE RESULTS OF SEPERATION OF POSTTEST OF THE CONTROL GROUP WITH NORMAL TECHNIQUE

LEVELS	CLASS	NUMBER OF STUDENTS
A	2/4	28
	2/6	8
B	2/4	14
	2/6	29
C	2/4	3
	2/6	8
TOTAL		90

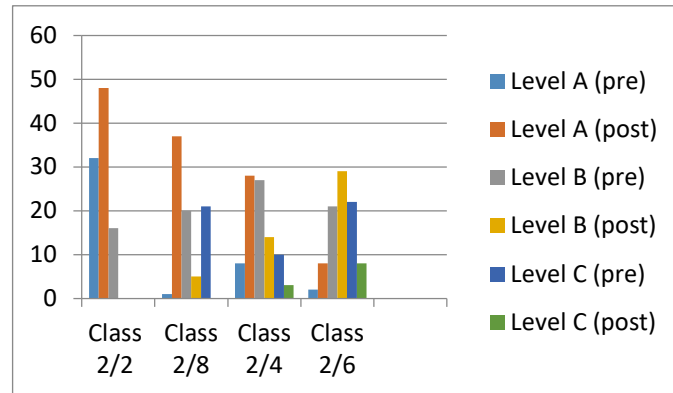
GRAPH IV. THE RESULTS OF SEPERATION OF POSTTEST OF THE CONTROL GROUP WITH NORMAL TECHNIQUE



When considering the results of separation of students after learning, it was found that learning management with STEM-Waldorf technique made a large change about in students' knowledge about ratios and percentages in the experimental group. The students in Class 2/2 achieved A grades. While, the students in Class 2/8 increased their grades from B to A and from C to B. No students got a C grade.

For clarity, Graph V shows the result comparison.

GRAPH V. THE RESULT COMPARISON OF SEPERATION OF PRETEST AND POSTTEST OF THE EXPERIMENTAL AND CONTROL GROUPS



When considering the results of the students in the control group, it was found that most of the students improved. In contrast to the experimental group some of the students obtained only C grades.

The overall pretest and posttest results for both of the groups can be found below in Tables VII and VIII.

The t-independent sample test was used to compare the difference of mean of pretest and posttest between both groups. It was found that the pretest score of both groups were different and the posttest score of both groups were different as well. The mean of the experimental group was higher than the mean of the control group.

TABLE VII. THE MEAN OF PRETEST AND POSTTEST

THE PERIOD OF THE TEST	SOURCE	N	MEAN	S.D.
PRETEST	experimental group	90	5.97	8.62
	control group	90	4.38	5.50
POSTTEST	experimental group	90	9.38	1.09
	control group	90	6.40	5.05

TABLE VIII. THE COMPARISON BETWEEN THE MEAN OF PRETEST AND POSTTEST

THE PERIOD OF THE TEST	SOURCE	N	MEAN	S.D.	T	P
PRETEST	experimental group	90	5.97	8.62	1 3 . 3 3 9	0 . 0 0 0 0
	control group	90	4.38	5.50		
POSTTEST	experimental group	90	9.38	1.09	8 . 0 1 5	0 . 0 0 0
	control group	90	6.40	5.05		

After finishing the process of STEM-Waldorf technique for the experimental group, the last research instrument tool used was a satisfaction questionnaire. This was developed by the researcher. A five point Likert scale was used which is summarized as follows:

- Level 5 refers to very satisfied
- Level 4 refers to slightly satisfied
- Level 3 refers to neutral
- Level 2 refers to slightly dissatisfied
- Level 1 refers to very dissatisfied

There were three main questions in the questionnaire; 1) questions relating to the advisor to increase the efficiency of learning management with STEM education, 2) questions about the places which created good learning atmosphere and environments with Waldorf education, and 3) questions about the understanding of learning activities to evaluate students' satisfaction when doing the activities and to apply some knowledge to the mathematics subject.

The researcher received 90 questionnaires back from the students. After that, the data were evaluated with statistics by

using arithmetic mean and standard deviation as shown in Table IX.

TABLE IX. THE EVALUATION OF STUDENTS' SATISFACTION ON STEM-WALDORF TECHNIQUE

ITEM	MEAN	S.D.
<b>The advisor</b>		
1. transferring knowledge easily	4.88	0.42
2. relating content to learning	4.86	0.44
3. motivating to learn	4.94	0.27
4. giving useful suggestions	4.93	0.29
5. making some inspiration to students	4.99	0.10
<b>The place and time</b>		
6. enough place for the activities	4.93	0.29
7. enough time for learning	4.94	0.27
8. good facilities and environment	4.93	0.33
<b>Knowledge and understanding</b>		
9. understanding knowledge from the activities	4.91	0.32
10. applying knowledge from the activities to mathematics subject	4.91	0.35
<b>Total</b>	<b>4.92</b>	<b>0.32</b>

It can be concluded from Table X that the experimental group with STEM-Waldorf technique were very satisfied in every item and they all were very satisfied the inspiration from the advisor via the "Powerful Stage activity" with most students giving a response of 5.00 with a very small standard deviation between results.

Moreover, students reflected some opinions and suggestions as follows;

- 1) they were fond of the activities and understood the content about ratios and percentages,
- 2) they wanted to use these kinds of activities again,
- 3) they liked to learn outside and inside the classroom because it reduced their stressed levels,
- 4) they wanted to learn like this in every subject,
- 5) learning like this was useful for the some low proficiency students because they could show their other skills and apply them to the mathematics subject, and
- 6) some of the students said that they would pass their exams if teachers taught with these activities in every lesson.

## VI. CONCLUSION

From the results, it can be concluded that STEM-Waldorf technique is an effective learning management tool in the subject of mathematics. It can increase students' learning achievement, inspiration, positive feelings towards the subject, the good relationship between teacher and students, and allows them to demonstrate their potential.

## ACKNOWLEDGMENT

I would like to express my special thanks of gratitude to Miss Kamolchanok Sornsuksith, a contract teacher of mathematics of Omnoi Sophonchanupatham School, Samut Sakhon Province, Thailand, who is my valuable research

assistant which collected all important data and helped me in doing a lot of research.

Next, I would also like to express my thanks to her Matthayom 2 (Grade 8) students in Classes 2/2 and 2/8 for their cooperation to joined two entertaining STEM activity; *The Powerful Stage*, as well as gave back their valuable feedback. Moreover, their cooperation in classes helped me a lot in finalizing this research within the limited time frame.

Finally, I would like to thank Mrs. Rebecca Petersen, an American STEM specialist, which is my good friend and buddy for her kind advice.

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# An analysis of the TOEIC test taking ability and needed skills for improvement of undergraduate students in Private University

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## Abstract

The purposes of this research were 1) to analyze the TOEIC test taking ability of undergraduate students in private university and 2) to study the skills that were required for improvement of the students. The research samples were 50 second year students at Thai-Nichi Institute of Technology in the 2017 academic year. The sample was derived through the Simple Random Sampling technique. The instrument used for gathering the data was a TOEIC test. The statistics used for analyzing the data were frequency, percentage, mean, and standard deviation.

The research findings were as follows: 1) TNI students had the ability in TOEIC test taking at a really poor level; 2) the students' needed higher listening and reading skills for improvement in the test.

**KEYWORD: TOEIC ANALYSIS, TOEIC TEST TAKING ABILITY, NEEDED SKILLS ANALYSIS, SKILLS IMPROVEMENT**

## I. INTRODUCTION

The TOEIC, or Test of English for International Communication, measures the ability of non-native English-speaking examinees to use English in everyday workplace activities. The Standard TOEIC exam does not measure the examinee's ability to speak or write in the English language, rather it measures listening and reading abilities. However, the TOEIC exam is still widely used for the evaluation of potential employees by human resource managers, and as a means of determining the potential for promotion of current employees [1].

The TOEIC is a two-hour norm-referenced and fixed response (multiple-choice) test. It is also a proficiency test, therefore measuring English ability in terms of a future criterion at the workplace. The TOEIC consists of four listening sections with a total of 100 questions (45 minutes) and three reading sections with a total of 100 questions (75 minutes). Candidates receive separate scores for listening and reading, on a scale from 5 to 495 points. These provide a total score on a scale from 10 to 990 points.

The ability in TOEIC test taking is significant to the students in improvement of the higher scores. Therefore, an analysis of needed skills should be managed to support the instruction in the right way. The development of teaching and learning needs to know the skills that should be improved in order to assist the learners immediately [2].

Consequently, it is vital for English Department, College of General Education and Languages, Thai-Nichi Institute of Technology to place teaching TOEIC and techniques in taking TOEIC test in learning activities as it erases issues of environmental boundaries, making it easier to do the TOEIC test relaxingly and effectively [3].

## II. ESEARCH PURPOSES

The purposes of this research were

- 1) to analyze the TOEIC test taking ability of undergraduate students in private university
- 2) to study needed skills for improvement of the students

## III. RESEARCH METHODOLOGY

### A. Population and Samples

Population of this research was 1,200 second year TNI students in 3 faculties of Engineering, Information Technology and Business Administration in the first semester of 2017 academic year. Samples of the research were 50 students who enrolled in English for Communication 3 course, derived through Simple Random Sampling technique. The instrument used for gathering the data was a TOEIC test. The statistics used for analyzing the data were frequency, percentage, mean and standard deviation.

### B. Instrumentation

The instrument used in this study was a TOEIC test. There were 200 items which could be divided into 2 parts: part 1 was a listening skill (100 items) and part2 was a reading skill (100 items).

Listening comprehension consisted of the following components:

1. Sentences about photographs	10 items
2. Stimuli-response	30 items
3. Short conversations	30 items
4. Short talks	30 items
Total listening	100 items

Reading Comprehension consisted of the following components:

1. Sentence completion	40 items
2. Passage completion	12 items
3. Short passages	48 items
Total reading	100 items
Total of the total	200 items



The duration of the test was 120 minutes. Five experts examined, corrected and improved the accuracy, validity and reliability of the language and contents of the test. The test had a difficulty level between 0.20-0.80 and a rank of discrimination was at 0.20 or over, the value of the test reliability was at 0.91. Then, the test was used to sampling of the research.

### C. Data Analysis

Data analysis from a TOEIC test presented a form of multiple choices. The scores were calculated to be the TOEIC scores with the criteria of Bruce Rogers [4] as the following criteria;

The scores from 805-990 refer to the excellent ability

The scores from 655-800 refer to very good ability

The scores from 555-650 refer to good ability

The scores from 405-550 refer to moderate ability

The scores from 305-400 refer to rarely poor ability

The score from 205-300 refer to poor ability

The score from 10-200 refer to very poor ability

The collected data was analyzed using a computer program. The statistics used for analyzing the data were frequency, percentage, mean and standard deviation.

## IV. RESULTS

### A. Phase 1: the raw scores of listening and reading with TOEIC scores in each skill

### B. The results of mean and standard deviation of listening and reading scores with TOEIC scores of undergraduate students in the total and in each aspect

According to convert TOEIC scores, the scores were calculated to be the TOEIC scores with the criteria of Bruce Rogers as the following criteria;

The scores from 805-990 refer to the excellent ability

The scores from 655-800 refer to very good ability

The scores from 555-650 refer to good ability

The scores from 405-550 refer to moderate ability

The scores from 305-400 refer to rarely poor ability

The score from 205-300 refer to poor ability

The score from 10-200 refer to very poor ability

The table above indicated that the undergraduate students had a rarely poor level of ability in TOEIC test taking. When considered in each aspect, it was found that listening skill was at 220 of TOEIC scores (M=42.94) and reading skill was at 165 of TOEIC scores (M=41.60).

Table showed that the students' needed skills for improvement were part 4 (Brief talks) at 21.13 % for a listening skill and part 7 (Reading materials) at 32.20% and part (Incomplete) at 33.70% for a reading skill.

TABLE I. TABLE OF THE RAW SCORES OF LISTENING AND READING WITH TOEIC SCORES IN EACH SKILL

No.	Listening	TOEIC of Listening	Reading	TOEIC of Reading	Total of TOEIC
1	26	115	23	60	175
2	33	160	45	180	340
3	37	185	21	50	235
4	32	155	19	40	195
5	34	165	35	125	290
6	33	160	37	140	300
7	20	85	29	95	180
8	36	180	24	65	245
9	31	145	27	85	230
10	30	140	30	100	240
11	42	210	30	100	310
12	61	325	56	240	565
13	29	135	24	65	200
14	30	140	33	115	255
15	46	240	46	185	425
16	33	160	35	125	285
17	75	400	82	400	800
18	30	140	25	75	215
19	31	145	25	75	220
20	34	165	29	95	260
21	40	200	55	230	430
22	25	110	26	80	190
23	51	265	48	195	460
24	34	165	47	190	355
25	30	140	37	140	280
26	61	325	64	285	610
27	38	190	37	140	330
28	41	205	38	145	350
29	47	245	60	260	505
30	53	280	66	295	575
31	52	275	41	160	435
32	52	275	26	80	355
33	58	310	65	290	600
34	67	355	67	300	655
35	37	185	33	115	300
36	44	225	36	135	360
37	72	380	72	335	715
38	52	275	50	205	480
39	47	245	48	195	440
40	36	180	34	120	300
41	56	300	56	240	540

42	33	160	38	145	305
43	50	260	48	195	455
44	42	210	41	160	370
45	54	295	63	280	575
46	44	225	34	120	345
47	49	255	39	150	405
48	39	195	33	115	310
49	63	335	54	225	560
50	57	305	49	200	505
Mean		220		165	385

TABLE II. TABLE OF THE RESULTS OF LISTENING AND READING SCORES WITH TOEIC SCORES OF UNDERGRADUATE STUDENTS IN THE TOTAL AND IN EACH ASPECT

	N	Min	Max	Mean	TOEIC	S.D.
Listening	50	20.00	75.00	42.94	220	12.79
Reading	50	19.00	82.00	41.60	165	14.97
Total				84.54	385	

### C. Phase 2 the results of needed skills for improvement of the students

TABLE III. TABLE OF THE RESULTS OF NEEDED SKILLS FOR IMPROVEMENT OF THE STUDENTS

	N	Min	Max	Mean	S.D.	%
part1: Photograph (10)	50	1.00	10.00	5.66	2.47	56.6
part2: Responses (30)	50	5.00	30.00	15.58	5.26	51.93
part3: Short conversation (30)	50	3.00	27.00	13.12	5.78	43.73
part4: Brief talks (30)	50	2.00	17.00	7.24	4.12	24.13
part5: Incomplete (40)	50	4.00	23.00	13.48	4.82	33.70
part6: Read the passages (12)	50	5.00	12.00	9.62	2.96	80.16
part7: Reading materials (48)	50	5.00	28.00	15.46	5.64	32.20

## V. DISCUSSION AND CONCLUSION

According to the findings, it was found that TNI students had the ability in TOEIC test taking at a rarely poor level. This is related to the study of Pengnate (2017) [5] on the difficulties of instructional process on English for proficiency test course suggested that the teacher who teaches this course should have an experience of proficiency test, TNI should invite a guest speaker from the outside organizations to inform the importance of TOEIC test, and teaching materials of TOEIC test should be updated every year.

Moreover, it was found from the study that the students needed to improve Part 4 (Short Talks) and Part 7 (Short Passages) of the TOEIC test. This is supported by Anandapong (2011) [6] who states that listening skills are a major problem of most test-takers because of insufficient listening ability as they cannot differentiate sounds or identify

the main ideas (Chonprakai 2009) [7]. For the problem of the TOEIC reading part, it is discussed by Tokunaga (2008) [8] who presents that the test-takers had the problem of interpreting the meanings, or understand and identify the main ideas of the reading texts with limited vocabulary knowledge. Cohan (2006) [9], further, highlights that a lack of reading comprehension skills and fail to understand the content of the reading test are an important cause of the low scores. Thus, enough knowledge of techniques and strategies for doing the test are needed to prepare for TNI students.

## ACKNOWLEDGMENT

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# The relationship of quality of work life among the staff at Photharam hospital

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## Abstract

The purposes of this research were 1) to compare the differences of personal factors for the quality of work life at Photharam Hospital, Rachaburi and 2) to study the relationship of quality of work life of the staff at the hospital. 320 samples were selected through convenience sampling. Questionnaires, which were designed by the researchers, were used as the data collection tool. The statistics used for analyzing data composed of the calculations of percentages, arithmetic means, standard deviations, the t-test, variance, and Pearson's Correlation Coefficient.

The research found that: 1) the quality of work life was different according to staff member's personal factors 2) the relationship of the quality of life had statistical significance between 0.44-0.59. The highest response was for the question relating to adequate and fair compensations and work and life in general ( $r_{xy} = 0.59$ ) and the lowest response was for the question relating to adequate and fair compensations and social relevance ( $r_{xy} = 0.44$ ).

**Keywords:** quality of work life, hospital staff, human resource management

## I. INTROUCTION

Personnel in the organization are important and valuable to the organization. The management team needs to understand the needs of their staff and integrate those needs with the organization's goals. At the same time, the staff must be satisfied, motivated and committed to working to achieve their goals. It is therefore necessary to strengthen staff to have a good quality of work life, that can lead to the efficient and productive operation of the organization. In other words, the overall aim is to achieve the goals of both individuals as members of the organization and the organization itself [1].

The quality of work life creates an atmosphere of satisfaction which will make staff produce high quality work through participation, problem solving, and also improving human resources. Improving human resources can also increase democracy in the organization. These factors also open opportunities for staff to generate creativities ideas, skills, and expertise in work performance which can be result in positive changes in behaviors and attitudes towards the organization. These in turn can result in lower levels of absenteeism, higher quality of products, and a decrease in employee frustration. [2]. There are many research papers that have indicated that quality of work life has a relationship with working performance [3- 5]. These could be summarized in stating that efficient employee performance will achieve the overall goals and objectives of the organization.

The performance would give return on investment for the organization and enhance personal growth. Improvements in personal growth can deliver benefits such as delivering services that respond to customer's needs and requirements, providing quality work and delivering under a specified time, doing a high standard of job that is recognized by management and colleagues, contacting and coordinating with other agencies effectively, and fixing problems quickly These are

effective and efficient requirements that every organization demand from their staff. Nevertheless, before these performances improve, the organization needs to provide a good quality of work life for their staff.

The quality of work life at a hospital has a broad meaning which covers all sides of individual work life and working environment of the organization. The common goal is to reduce mental stress and increase job satisfaction. This is an important mechanism for improving the quality of life in hospitals. This is especially the case in well-being, needs, systems, and administration. Creating morale support by providing welfare can build organizational commitment and also bring out the inner power in staff to generate creative ideas for work, excitement, and self-value [6].

Photharam hospital was the first district hospital in Thailand. It was established in 1952 by the district committee, merchants, and people in the district. The intention was to help the sick and to have a community hospital in order to serve patients promptly. It has been in operation for 65 years and has served people in Ratchabury province and as well as nearby areas. The hospital has a clear vision states that they aim; "To be the hospital of faith and be a dependency for the people". Their identity focuses on "Sufficiency, Discipline, Honesty, Volunteer Spirit". The hospital's core value is "Integrity Learning and Unity" [7]

These visions could not be achieved if staff were not passionate about their jobs and did not enjoy working at the hospital. The researchers believe that if the staff at the hospital had a good quality of work life, then good quality services would follow.

### A. Research Objectives

1) To compare the differences of personal factors for the quality of work life at Photharam Hospital, Rachaburi.

2) To study the relationship of quality of work life of the staff at the hospital.

#### B. Research Hypotheses

H1: The quality of work life of the staff at Photharam hospital was different according to personal factors.

H2: The relationship of quality of work life of the staff at Photharam hospital has statistical significance.

## II. RESEARCH FRAMEWORK

From the concept about quality of work life and related research on this topic in general workplace [3-5,15] and in the hospitals [1,6,9-14], the conceptual framework can be summarized as follows.

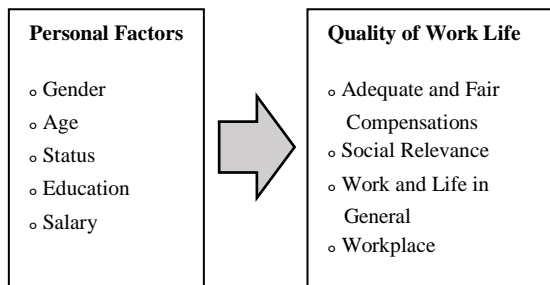


Fig. 1. Conceptual framework

## III. RESEARCH METHODOLOGY

### A. Population and sample size

The population for the study was 1,580 full-time and part-time staff who worked at inpatient wards and special task unit at nursing department. The sample size contained 320 sets in total which was calculated using Taro Yamane's method [8], Convenience random sampling was used in order to select the population for study.

### B. Research Instrument

A questionnaire was used to collect data in this research. This was constructed by the researchers through the use of theoretical concepts, related research, and the research conceptual framework. The contents of the questionnaire could be divided into 2 parts.

Part 1: Questions about personal factors of the respondents. These details were collected using closed-ended questions in a format of a check-list.

Part 2: Questions on the quality of work life among the staff at Photharam hospital. This set of closed-ended questions contain 5-rating scales of check-lists.

The questionnaire was verified for validity and reliability using the calculation of Cronbach's alpha reliability of the tool using Cronbach's alpha [16] The result was 0.74 - 0.82. showing that the questionnaire could be used for the research.

## IV. RESEARCH RESULTS

The results showed that most of the respondents were females, The majority of respondents were aged 31-40. They were married, had a bachelor's degree, had a salary 15,001 – 20,000 Baht per month, and were full-time staff.

The results revealed that the level of quality of work life was considered a high level in all aspects.

1) The meanresult for questions relating to adequate and fair compensations was 3.81, meaning that the respondents felt their salary was suitable for their job responsibility.

2) The mean response for social relevance was at 3.87. This shows that the respondent felt they had the opportunity to support and to facilitate social services.

3) The mean result from the questions relating to work and life in general was at 3.91. This meant that the respondents were satisfied from working with colleagues.

4) The mean result of the questions relating to the workplace was 3.91. This shows that the respondents felt the hospital focuses on cleanliness and work allocation

TABLE I. PERSONAL FACTORS

Personal Factors		No.	%
Gender	Male	114	35.63
	Female	206	64.38
Age	Less than 31	102	31.88
	31 - 40	119	37.19
	More than 40	99	30.94
Status	Single	119	37.19
	Married	159	49.69
	Divorced/Separated	42	13.13
Education	High school	46	14.38
	Vocational Certificate/Diploma	82	25.63
	Bachelor's degree	142	44.38
	Higher than bachelor's degree	50	15.63
Salary	5,000 - 15,000 baht	72	22.50
	15,001 - 20,000 baht	77	24.06
	20,001 - 25,000 baht	73	22.81
	25,001 - 30,000 baht	48	15.00
	30,001 - 35,000 baht	34	10.63
	More than 35,000 baht	16	5.00
Position	Full-time staff	215	67.19
	Part-time staff	105	32.81

The result found that there were differences in quality of work life in terms of personal factors, including gender, age, status, education, and salary.

The results indicated that the relationship of quality of work life of the staff at Photharam hospital has statistical significance between 0.44 – 0.59. The most relevant value was between adequate and fair compensations and work and life in general ( $r_{xy}=0.59$ ) and the least relevant value was between

adequate and fair compensations and social relevance ( $r_{xy}=0.44$ ).

TABLE II. LEVEL OF QUALITY OF WORK LIFE

Items	Mean	SD.
Suitable salary for the job responsibility.	3.90	0.88
Satisfied with the welfare received beyond the salary.	3.80	0.77
Receive suitability compensation for similar profession.	3.73	0.86
<b>Adequate and Fair Compensations</b>	<b>3.81</b>	<b>0.73</b>
Impressive nursing cares.	3.84	0.69
Work makes social values.	3.87	0.66
The opportunity to support and to facilitate social services.	3.90	0.70
<b>Social Relevance</b>	<b>3.87</b>	<b>0.55</b>
Have an adequate rest-time	3.85	0.72
Time management for work and private life	3.89	0.71
Nursing work is not a barrier and does not affect the way of life.	3.89	0.98
Satisfaction from working with colleagues.	4.01	0.74
<b>Work and Life in General</b>	<b>3.91</b>	<b>0.61</b>
The hospital focuses on cleanliness and work allocation.	3.91	0.72
The hospital has sufficient equipment and tools.	3.90	0.74
<b>Workplace</b>	<b>3.91</b>	<b>0.65</b>

TABLE III. QUALITY OF WORK LIFE ACCORDING TO PERSONAL FACTORS

	Adequate and Fair Compensations X1	Social Relevance X2	Work and Life in General X3	Workplace X4	Quality of Work Life
<b>Gender</b>	3.84*	0.99	2.35*	0.71	2.62*
<b>Age</b>	0.88	3.05*	3.06*	3.41*	2.78*
<b>Status</b>	8.34*	2.98*	8.37*	1.84	7.91*
<b>Education</b>	3.83*	1.68	4.78*	3.35*	4.60*
<b>Salary</b>	6.79*	1.67	4.26*	0.48	3.13*

TABLE IV. THE RESULT OF RELATIONSHIP OF QUALITY OF WORK LIFE OF THE STAFF AT PHOTHARAM HOSPITAL

	Adequate and Fair Compensations X1	Social Relevance X2	Work and Life in General X3	Workplace X4
<b>X1</b>	1.00	0.44	0.59	0.33
<b>X2</b>		1.00	0.51	0.48
<b>X3</b>			1.00	0.56
<b>X4</b>				1.00

## V. CONCLUSION DISCUSSION AND SUGGESTIONS

The results demonstrated that quality of work life of the staff at Photharam hospital was different for different staff depending on their. Differences were observed between staff of different genders, ages, status, education, and salaries. This results are consistent with a study Chompunuch Sriphong [15] on Quality of work life among the staff at private sector workers in Yala province.

The relationship between quality of work life of the staff at Photharam hospital had a statistical significance between 0.44 – 0.59. This is consistent with a study by Soliha Fathimath, Ratanawadee Chontawan, and Bunpitcha Chitpakdee [10]. This showed that quality of work life in general and four aspects of recognition were factors at the medium level, and had a significantly positive relation with responsibility. Sureeporn Sakunee, Piyathida Tridech, Suchonta Siri, and Sakda Tridech [13] pointed out that the management team management should have a policy to improve the quality of work life, fair compensation and benefits package according to position, living conditions, current economic situation. Encourage staff at all levels to participate in improvement quality of work life plan and activities consistent with the context of the hospital.

The results revealed that the highest correlation of quality of work life was between adequate and fair compensations and work and life in general ( $r_{xy}=0.59$ ). The results also reflected the importance of adequate compensations. Nursing care for example is a hard work and requires a lot of dedication. This result is consistent with Thidarat Srigunta's study [14]. This is especially the case for adequate salary and compensations for living in the current economy.

### A. Policy Suggestions

1) The quality of work life of the staff at Photharam hospital was found to differ depending on personal factors. The focus, therefore, should be on the differences between those factors; especially work and life in general aspect. From the questionnaire, it was found that most of the respondents would like to have an adequate rest-time, good time management for work and private life, for nursing work not to be a barrier and to not affect their way of life, and also

satisfaction from working with colleagues. These should be important issues for human resource management.

2) The management team should determine a policy to improve the quality of work life. This should focus on a fair compensation and benefits package. It should also encourage staff at all levels to participate in improving the quality of work life planing and activities consistent with the context of the hospital.

#### *B. Suggestions for Further Studies*

1) This research was quantitative research. Qualitative research or mix method, however, can be conducted in order to obtain more in-depth information.

2) The results showed that the quality of work life between full-time and part-time staff were different in all aspects. Studying the reasons for these differences would be interesting to further knowledge on this area.

3) There should be a study on influencing factors on quality of work life such as organization atmosphere, happy workplace, and organization commitment to find the relationship between each factor and quality of work life.

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# Factors affecting the loan pattern of member of savings cooperative of SCG Packaging Co., Ltd.

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## Abstract

The purposes of this research were (1) to compare the loan patterns of the members of a savings cooperative classified by personal factors. (2) to study the factors affecting the loan patterns of member of a savings cooperative at SCG Packaging Co., Ltd. This research used purposive sampling and included 334 employees of SCG Packaging. The research instrument that was used was a survey using rating scales questions constructed by the researcher. The statistics that were used were percentage and standard deviation. The inference statistics were T-test, One Way ANOVA and multiple regression analysis.

The findings of the study were as follows: (1) The pattern of emergency loans was defined by age, educational status, income and working hours of employees (2) Factors influencing the pattern of emergency loans include: ( $\beta = -0.18$ ) Expected cost ( $\beta = 0.16$ ) and accumulated debt ( $\beta = 0.11$ ) The equation that was produced as a part of this research has predictive power of 19% and can be written as follows:  $Y = 1.18 - 0.12X_1 + 0.11X_2 + 0.05X_3$

**Keywords:** Savings Cooperative, Loan patterns, Pulp and paper

## I. INTRODUCTION

The industrial revolution often introduced machines to replace human workers, This caused economic changes and led to unemployment. There was a general economic downturn and a great deal of trouble from people being replaced by machinery and being removed from their factories. Minor entrepreneurs had to abandon their businesses. Investors are currently trying to make the most of their investment by exploiting labor in every way. As laborers were oppressed, they seek the means to relieve their misery. At the same time, there are economists who are eager to help improve their social status. The plan was to provide economic equality to the society by collaborating between people who are suffering. This had been proposed as the cooperative system and was created at a later time. [1]

Living in the current economic climate has caused those with low levels of income to be unable to cope with the increasing cost of living. The way people deal with the problem is to borrow money from institutions outside of the formal banking system or from outsiders. The loan interest rate is much higher than the institutions in the system. As a result, many savings cooperatives have come to play an important role in daily life. They are a source of loans that help members in need and the interest rate is low.

Savings and Credit Cooperatives are financial institutions with a membership of the same profession or community. They encourage saving, depositing money from members, and offering returns in the same interest rate as commercial banks. By holding monthly withholding but not exceeding 1 in 5 of the total shares at the end of the accounting year, the stock dividend must be paid to members at the rate prescribed by law. It also provides loans to members as needed. As of December 31, 2016, there were 1,415 active savings cooperatives in Thailand. [1]

Savings Cooperatives are the source of loan funds, making family institutions more stable. Savings Cooperatives

are financial institutions that are dedicated to helping their members with the main objective of providing loans to members in the time required. This research will investigate SCG Packaging employees who provide a cooperative loan service. Currently there are three types of loans: emergency loans, ordinary loans and special loans (for housing). Most provide services that are consistent with the well-being of the members. This should be done in line with the member's ability to repay any loans given. Savings cooperatives should always study the economy. This is the policy and planning information for the members of the cooperative.

This research is on the borrowing patterns of cooperative members. The researchers were interested to study the factors that affect the loan SCG Packaging staff. It is hoped that this will improve the loan to be useful in planning the policy for the operation of the loan to the appropriate members.

### A. Research Objectives

(1) To compare the loan patterns of the members of a savings cooperative classified by personal factors.

(2) To study the factors affecting the loan patterns of member of a savings cooperative at SCG Packaging Co., Ltd.

### B. Research Hypotheses

(1) The patterns of borrowing of employees of SCG Packaging varies according to gender, age, education status, income per month and the duration of membership.

(2) Discipline in saving, family responsible expenses and existing debt affecting the pattern of borrowing of employees SCG packaging.

## II. RESEARCH FRAMEWORK

Research providing Frameworks for savings cooperative [2] the patterns of borrowing of employees [3]The discipline in saving [4-6] the personal factors affect to the patterns of member of savings cooperative [7- 8]

There were found to be three types of cooperative loan schemes offered to members:

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(1) Emergency loans in cases where members have urgent needs or unexpected expenses. Members can borrow up to half of their monthly income from the cooperative. The limit of the loan is based on the status of each cooperative and the repayment is not more than two monthly installments. This type of loan does not require collateral.

(2) Ordinary loan this member can borrow about 4-15 times of monthly income but it is limited by the status of each cooperative member. It must be repaid within 24-72 monthly installments and must have members together with at least two guarantors. The average salary of each cooperative member is used as a basis for determining the amount that can be loaned to a member. For example a member of the cooperative with an average monthly income 10,000 baht / month would only be given an emergency loan of up to 5,000 baht. The average loan amount for an ordinary load would be 40,000-150,000 baht. However, it depends on the financial status of the member and is up to the discretion of the cooperative committee.

(3) Special loan if the cooperative's status is stable. The cooperative will open a special loan service for borrowers to invest in their careers or to borrow for housing. The amount of money that can be borrowed for this type of loan is determined by the amount of money needed to invest in a career or the cost of the house and land that the member is interested to buy. It is also limited to no more than 400,000-1,000,000 baht and is repayable within a term of 10-15 years, with real estate as a principal mortgage.

When to integrate to create a questionnaire. And the concept is as follows.

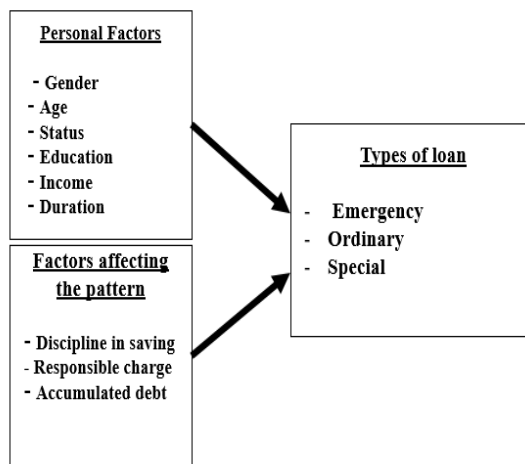


Fig. 1. Conceptual framework

### III. RESEARCH METHODOLOGY

#### A. Population and sample size

The samples of this research were calculated by using the Taro Yamane method. A total of 334 samples were selected the total population [9]. The sampling method that was used was convenience sampling.

#### B. Research Instrument

The research instrument was a questionnaire developed by the researcher. The questionnaire was tested for content validity by 3 experts, It was found to be consistent with the

objectives and assumptions of the research; the questionnaire was divided into 3 sections.

Part 1: Facts about personal factors. The questionnaire is a checklist.

Part 2: Factors Affecting pattern of borrowing. These questions seek to establish if there is discipline in saving, if the respondent has regular family expenses and if they have existing debt. The questionnaire uses an approximation scale and open-ended questions.

Part 3: There are three types of cooperative loan schemes offered to members: emergency loans, ordinary loans and special loans. The questionnaire was selected as a dummy variable

### IV. RESEARCH RESULTS

#### Personal factors of respondents

The majority of respondents were male (70.36%). Most of the respondents were aged 36-40 years (29.04%). Most of them were married (51.80%). They had a bachelor's degree level of education (42.51%). Their monthly income was 25,001-35,000 baht per month (42.81%) The largest group of respondents had been members of the cooperative for 11-15 years (21.86%)

TABLE I. Types of loan for SCG Packaging Employees Classified by Personal Factors

	Emergency	Ordinary	Special
<b>Gender</b>	-4.54**	4.06**	0.82
<b>Age</b>	19.55**	13.29**	12.00**
<b>Status</b>	10.61**	7.42**	0.60
<b>Education</b>	19.98**	7.49**	16.25**
<b>Income</b>	50.91**	23.89**	10.15**
<b>Duration</b>	41.00**	21.84**	13.25**

The research found the following. 1. Loans were different based on gender. Women are significantly more likely to have emergency loans than the males respondents. 2. Loans were different depending on respondent age. The 25-30 age group was found to take the most emergency loans. The 41-55 year group was found to take the most will loan the ordinary loans and the 55+ age group was found to take the most special loans. 3. Loans were different according to the status of the respondent. The single group to recover the emergency loan. 4. The loan pattern was different according to the education level of the respondent. Respondents that graduated with a bachelor degree or higher were found to be more frequent users of special loans. 5. The amount of money loaned is different depending on the income of the respondent. Those who have income of less than 15,000 baht are more frequent users of emergency loans. Those with incomes of 35,000-45,000 Baht per month are more frequent users of ordinary loans and respondents with income of 45,000-55,000 Baht per month were found to be the highest users of specially loans. 6. The loan Pattern was found to be different depending on the duration of membership of the cooperative. People who had been members for less than 1 year were most frequent users of emergency loans. Those who had been members for 16-20 years were the most frequent users of ordinary loans and



those with more than 20 years of membership were most likely to take out special loans.

TABLE II. Factors affecting the pattern of Emergency Loans for Employees of SCG Packaging

Emergency Loans	B	SE.	Beta	t	sig
(Constant)	1.18	0.17		6.80	0.00
Discipline in saving	-0.12	0.04	-0.18	-2.77	0.01
Responsible charge	0.11	0.04	0.16	2.45	0.01
Accumulated debt	0.05	0.02	0.11	2.04	0.04

$$R^2 = 0.19$$

The research found that Factors affecting the pattern of emergency loans included: Discipline in saving ( $\beta = -0.18$ ), Responsible charge ( $\beta = 0.16$ ) and accumulated debt ( $\beta = 0.11$ ). The equation has the predictive power of 19%. The equation as follows:

$$Y = 1.18 - 0.12X_1 + 0.11X_2 + 0.05X_3$$

TABLE III. Factors affecting the pattern of Ordinary Loan for Employees of SCG Packaging

Ordinary Loan	B	SE.	Beta	t	sig
(Constant)	0.04	0.18		0.23	0.82
Discipline in saving	-0.08	0.04	-0.12	-1.85	0.06
Responsible charge	0.09	0.04	0.13	2.02	0.04
Accumulated debt	0.08	0.02	0.18	3.28	0.00

$$R^2 = 0.17$$

The research found that Factors that affect the pattern of Ordinary loans include: Discipline in saving ( $\beta = -0.12$ ), Responsible charge ( $\beta = 0.13$ ) and the accumulated debt ( $\beta = 0.18$ ) equals the predictive power of 17%. The equation as follows:

$$Y = 0.04 - 0.08X_1 + 0.09X_2 + 0.08X_3$$

TABLE IV. Factors affecting the pattern of Special Loan for Employees of SCG Packaging

Special Loan	B	SE.	Beta	t	sig
(Constant)	-0.22	0.11		-2.02	0.04
Discipline in saving	-0.04	0.03	-0.09	-1.38	0.17
Responsible charge	0.02	0.03	0.04	0.61	0.54
Accumulated debt	0.03	0.01	0.11	2.07	0.04

$$R^2 = 0.13$$

The research found that Factors affecting the pattern of Special loan include: Discipline in saving ( $\beta = -0.09$ ), Responsible charge ( $\beta = 0.04$ ) and the accumulated debt ( $\beta = 0.11$ ) are 13%. The equation as follows:

$$Y = -0.22 - 0.04X_1 + 0.02X_2 + 0.03X_3$$

It is noteworthy that the only case where the cumulative debt condition has a significant effect on the loan is with special loans.

## V. CONCLUSION DISCUSSION AND SUGGESTIONS

The pattern of loans of SCG Packaging employees varies according to personal factors. The results of this research were consistent with existing research. [5] The personal factors correlated with Discipline in saving of informal workers, number of persons in sponsorship, income per month, Expenses per month and the monthly debt at the statistical significance level of 0.05. This was the same result as shown in other research [7-8]. It is concluded that those involved in savings cooperative should study these results and use them to and bring the result to plan allocation of loans to employees. It has been found that lending is related to personal qualities that are interrelated, such as the age of the cooperative member. The income of younger employees is lower and they are not always cooperative members buy they need to use emergency loans. Older people are more likely to be careful with their income and become cooperative members. There are likely to be normal and special recovery sequences. That represents the consistency of the borrower with the properties at the pulp and paper group savings.

The research found that the discipline of savings is inversely related to loans take out and people taking out ordinary loans. The results show that savings discipline is necessary [4], suggesting that discipline in saving money a little continuing the contract term will reduce the problem of loan. [6] Savings are good if they have a saving discipline. It will reduce the risk of liability. Family responsibility costs were seen to result in an increase in the trend in emergency and casual loans for SCG Packaging staff. This is consistent with existing research [3]. Increased family influence on saving decisions. The existing cumulative debt condition will be increased in the increase of all types of loans. Stakeholders should pay attention to financial discipline in order to reduce the likelihood of an increase in accumulated debt.

### A. Policy Suggestions

(1) Financial discipline factors will affect the paying off a loan, while family burden and accumulated debt will result in an increase in borrowing. To teach the members of the cooperative about disciplined use of money and the philosophy of sufficiency economy is efficient and effective in SCG Packaging Co., Ltd.

(2) The cooperative management should arrange various loan policies in accordance with the personal qualities of the borrowers. To reduce bad debt and to increase the benefit of the loan to cooperative members who are saving with the cooperative.

### B. Suggestions for Further Studies

(1) The research focused on quantitative research. Interested parties may wish to conduct qualitative research in order to study in-depth information on the reasons why members of the cooperative require loans. This information could be useful in the planning of the savings cooperative.

(2) Cooperative Principles guide the way cooperatives behave, They are as follows; 1) Membership is voluntary and open. 2) Democratic control by members. 3) Economic participation of members. 4) Self-Government and Independence 5) Education, Training and Information 6) Cooperative with between Cooperation 7) Commitment to the community. Based on the research, it was found that the predictive power of the researcher's equations was not high.

(3) The concept should be extended to other cooperative groups such as agricultural cooperatives and the Cooperative Credit Union to compare findings.

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No.	Nationality	Number of Participants
1	Thai	240
2	Indian	1
3	Indonesian	1
4	Korean	2
5	Sri Lankan	3
6	Taiwanese	15
7	Americans	2
8	Filipinos	4
<b>Total</b>	268 Participants	

### Summary of participants

Thai participant      89.55 %

Foreign participant   10.45%

No.	Country	Number of Papers
1	The Kingdom of Thailand	84
2	The United States of America(USA)	6
3	The Republic of Indonesia	1
4	The Republic of Korea (South Korea)	1
5	The Democratic Socialist Republic of Sri Lanka	4
6	India	1
7	Republic of China (Taiwan)	13
<b>Total</b>	110 papers	

### Summary of Papers

Papers from Thailand %      76.36%

Papers from other countries %      23.64%

## List of Peer Reviews

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Col. Artcha Boongrapu	Expert, Thailand
Assoc. Prof.Dr. Sarun Wattanutchariya	Expert, Thailand
Assoc. Prof.Dr. Sunuttra Taboonpong	Expert, Thailand
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Asst. Prof.Dr. Kittipun Boonin	Nakhon Pathom Rajabhat University, Thailand
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