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# 修 平 學 報 特 刊

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# SPECIAL ISSUE OF HSIUPING JOURNAL

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## （Short Communication）

# Guidelines for Tomato Farmer Practice to Comply with the Thai Agricultural Standard: the Case in Bann Na-ngoi, Sakon Nakhon Province, Thailand

Piyachint Paddamadilok*, Jarita Hinthao

## Abstract

The objectives of this study were to investigate the existing tomato production system at Bann Na-ngoi, Sakon Nakhon province, Thailand and to build a guideline for tomato farmer practice to comply with the Thai agricultural standard for food crop. The participatory rural appraisal (PRA) was used as the main method for this study and data were collected by key informants (KIs) interview, focus group discussion and participatory workshop. This study was conducted in the year 2015 to 2016 growing season. The results revealed that tomato farmers at Bann Na-ngoi grew tomato by conventional method. The purposes of tomato cultivation were household consumption and income. The main tomato varieties were perfect gold 111 and NS81 and gave yield ranging from 8,500-10,100 kg/rai. The input costs and income for tomato farming were about 7,280-7,500 bath/rai, 40,000-55,100 bath/rai respectively. Most of the farmers sold their tomato to the third royal factory Tao-ngoi and some of them to local market. The problem of tomato farming can be categorized into 3 groups as following, 1) problems that are caused by the environment, 2) pest control and 3) marketing problems. The guidelines for tomato farmer practice to comply with the standard consist of 8 steps as follow, 1) setting the goal to comply with the standard 2) development of farmer organization and networks 3) increasing knowledge 4) mentor team 5) farmer to farmer learning 6) learning by doing 7) participatory evaluation and 8) lesson learned. Further study the lesson learned at the different kinds of agricultural standard is suggested.

**Keywords**: Tomato Production, Farmer Practice Guidelines, Thai Agricultural Standard, Sakon Nakhon Province.

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# 1. Introduction

Tomatoes are a plant that is promoted by the government and the private sector for farmers to grow as crops after rice. Tomatoes are an important economic and industrial plant of Thailand. It grown can be divided into 2 types, namely, tomatoes, sent to industrial plants. And tomatoes eat fresh fruit. By planting tomatoes, mostly 80 - 90%, is planted for sending industrial plants. From the annual vegetable growing statistics of the Department of Agricultural Extension, 2016/60[1] shows that there are 13 tomatoes grown in industrial plants in Thailand. The number of households is 3,400 households. The total area is 14,868 rai. The total production is 50,716 tons. The output per rai is 4,709 kilograms. The selling price per kilogram is 5.41 baht. The top 5 are Sakon Nakhon, Nakhon Phanom, Mae Hong Son, Bueng Kan and Nong Khai, as shown in the following table.

Table 1. Tomato Planting Area Send Industrial Plants of 2016 in Thailand in the Top 5 Areas

| Order | Areas | The number of households (households) | The total area (rai) |
|---|---|---|---|
| 1 | Sakon Nakhon | 1,213 | 5,259 |
| 2 | Nakhon Phanom | 1,074 | 4,015 |
| 3 | Mae Hong Son | 27 | 2,301 |
| 4 | Bueng Kan | 498 | 1,917 |
| 5 | Nong Khai | 346 | 1,012 |

*Source: The Department of Agricultural Extension, 2017.*

From the above information, it shows that Sakon Nakhon province is the province that has the highest number of tomato plantings in the country. Ban Nangoi, Tambon Tao Ngoi, is an area in Tao Ngoi District. Sakon Nakhon province with tomato growers sending industrial plants about 80% of households (280 households from 350 households). This is because the third royal factory Tao-ngoi is located at Ban Nangoi. To buy tomatoes to be processed into products. In the year 2015 to 2016 growing season, the main tomato varieties were perfect gold 111 and NS81 and gave yield ranging from 8,500 - 10,100 kg/rai. The input costs and income for tomato farming were about 7,280 - 7,500 bath/rai, 40,000 - 55,100 bath/rai respectively. Most of the farmers sold their tomato to the third royal factory Tao-ngoi.[2] The problem of tomato farming can be categorized into 3 groups as following, 1) problems that are caused by the environment, 2) pest control and 3) marketing problems. From all 3 problems, it was found that the diseases and pests that were spread Is an important problem that causes damage to trees and a lot of tomato production. Therefore, in order to solve immediate problems, farmers have used chemicals to solve this problem. However, what follows from the incorrect use of chemicals is The amount of residual chemicals in the air, soil, water, farmers and tomato production that will

be passed on to consumers is not safe for consumers. This is because tomato growers have not yet entered the Thai agricultural standard system for food crops. Causing farmers to lack knowledge and skills in producing safe agricultural products. Therefore, the government and private sectors should encourage farmers to enter the Thai agricultural standard for food crops. To produce safe agricultural products that are of good quality and safe in accordance with the specified standards. However, the production process must be safe for farmers and consumers. Without chemical contamination does not cause pollution to the environment. But the farmers will enter the Thai agricultural standard system for food crops that the farmers are not familiar with. Farmers need to have good practices. This research therefore aims to create guidelines for farmers to enter Thai agricultural standards for food crops.

## 2. Material and Methods (or Experimental)

This research is a participatory action research. Therefore, the research team designed the research. By allowing people in the community who are direct stakeholders to participate in this research. In the research process, there is a design to determine the sample group. Is a tomato grower, Nangnoi house and a key informant using snowball technique according to the topic of semi-structured interview (Semi-structured interview: SSI). This research uses several methods of data collection, including observation, depth interview, group interview and participatory workshop. (Participatory Workshop: PW) using techniques for data collection Participatory Rural Appraisal: PRA). In the analysis of data, it consists of (1) content analysis interpreted to find the relationship (2) triangular data examination (Triangulation) to verify accuracy And reliable data (3) for information obtained from participatory workshops (Participatory workshops) will conduct the examination, fulfillment and analysis of the meeting stage in order to obtain a conclusion and consensus in the participatory workshop stage.

## 3. Results and Discussions

The guidelines for tomato farmer practice to comply with the standard consist of 8 steps as follow.

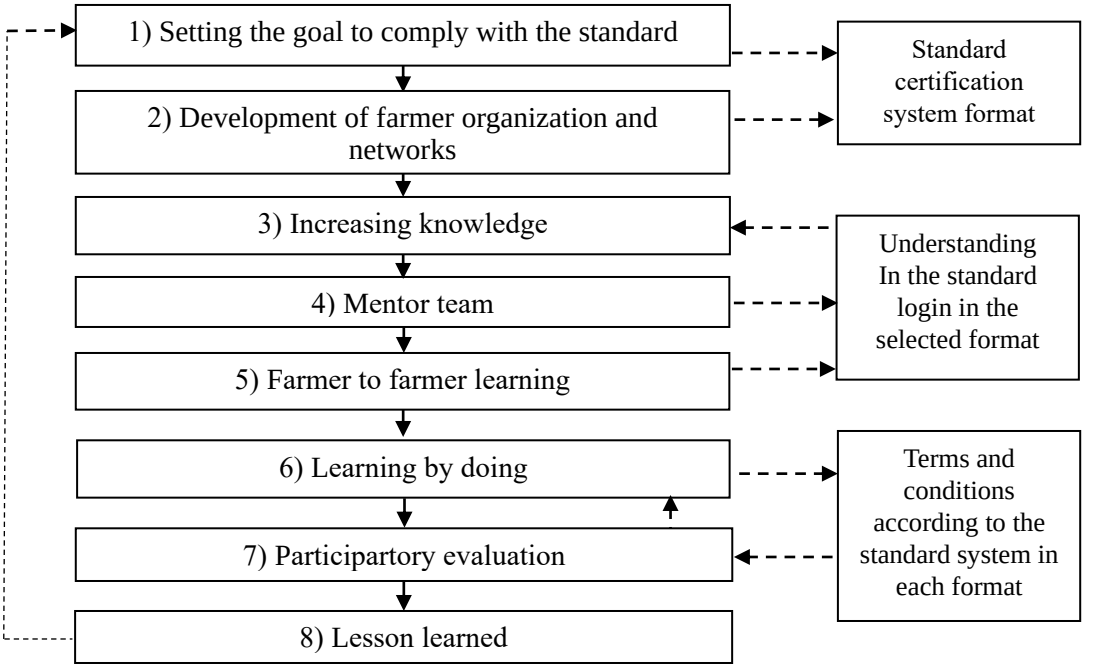


Figure 1 Guidelines for tomato farmer practice to comply with the standard

Based on the above guidelines, it is found that step 1 is consistent with the goal setting theory of Edwin A. Locke and Gary P. Lathum, who said that normally everyone who aims at any activity must have the goal of that action and the effort required to achieve the goal. [3] And step 2 is consistent with the concept of local community development institutions [4] that say, network means coordination of forms that link the work of many individuals or organizations. This has resources with a goal, having a group of members of their own with ideas, problems, needs in a particular subject or similar Come to contact or coordinate to do one or more activities.

# 4. Conclusions

The guidelines for tomato farmer practice to comply with the standard consist of 8 steps as follow, 1) setting the goal to comply with the standard 2) development of farmer organization and networks 3) increasing knowledge 4) mentor team 5) farmer to farmer learning 6) learning by doing 7) participatory evaluation and 8) lesson learned. In addition to following all 8 steps, there are suggestions for tomato growers as follows: (1) Farmers should study each standard system to understand before making a decision. (2) Farmers should make their own analysis that should choose the format of product management in the form that will be appropriate and consistent with the most themselves. Should not choose according to other farmers' friends and (3) farmers should adjust their attitude to accept new things and changes from the traditional

practices.

## Acknowledgments

This research was successful. The research team would like to thank the Office of the National Research Council of Thailand (NRCT) Sakon Nakhon Rajabhat University for supporting the budget. And tomato growers, Nangnoi home. Thank you, friend, for sharing ideas. Always being supportive and supporting the work.

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# Agricultural Extension Approach to Good Agricultural Practice: the case of Small-Scale Tomato Farmers in Sakon Nakhon Province, Thailand

Yuphin Somkhumphee[a*], Piyachint Paddamadilok[b]

## Abstract

The objectives of this research were to 1) study good practices of certified small-scale tomato farmers, 2) develop the agricultural extension approach to good agricultural practice for tomato, and 3) evaluate the implementation of that approach by small-scale tomato farmers in Sakon Nakhon province. The research were conducted in the year 2015 to 2017 by using mixed methods. The populations were 776 small-scale tomato farmers in Sakon Nakhon province which were purposive sampling of 9 certified small-scale tomato farmers for lessons learned. According to connoisseurship, it was found that good practice of GAP for tomato at small-scale farmers was based on 4 key success factors as (1) leadership, (2) community farmer enterprise, (3) resource and (4) extension. The agricultural extension approach to good agricultural practice for tomato was the participatory agricultural extension approach to good agricultural practice for tomato (PAE to GAP for tomato). The implementation of the PAE to GAP for tomato approach at the farm level of 6 voluntary farmers found that the pre-test and post-test scores of all farmers practices were significantly different at $P<0.05$ in all provision of GAP and complied with the GAP standard. Further study the implementation of the PAE to GAP for tomato approach to small-scale tomato farmers in other provinces is suggested.

**Keywords:** GAP, Thai Agricultural Standard, Small-Scale Farmer, Tomato, Sakon Nakhon Province.

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# 1. Introduction

According to the growing environmental and health concerns associated with modern agriculture, several countries around the world has adopted the standard of Good Agricultural Practices (GAP) to ensure safe and qualified food supply. In 2003, Thai government announced the national food safety policy under two authorizations i.e., Ministry of Agriculture and Cooperatives and the Ministry of Public Health. In 2005, the "Framework on Monitoring and Control of the Quality of Agricultural Commodity and Food" was formulated. Meanwhile, the concept of food safety from farm to table has been included in the plan of both ministries. Ministry of Public health controls food for domestic consumption while Ministry of Agriculture takes responsibility for trade and export of agricultural products. Thai agricultural commodity standards were announced continually to facilitate trade (Korpraditskul et al., 2010). Good Agricultural Practice (GAP) was announced as a standard for producers and be promoted ever since. In 2013, Thailand has developed Thai agricultural standard (TAS 9001-2013) [4] that is good agricultural practices (GAP) for food crop as a voluntary standard which announced the domestic concern rather than international market. This agricultural standard covers provisions of good agricultural practices (GAP) for food crops such as vegetables, fruits, field crops, spices and herbs on every step on farm and postharvest handling where produce is packed and/or collected for sale in order to obtain safe produce of proper quality for consumption by taking into account the environment, worker's health, safety and welfare. [4] Currently, this GAP for food crop standard is implemented locally to build capacity of smallholder farmer group and individual small scale farmer. [3] The Farmers who are willing to apply to get certified for their products are assessed on their processes of production. The GAP for food crop standard consists of eight key elements as 1) water 2) planting area 3) pesticides 4) pre-harvest quality management 5) harvest and postharvest handlings 6) holding, moving produce in planting plot, and storage 7) personal hygiene and 8) Record keeping and traceability which related to modules of food safety, produce quality, environmental and worker health, safety and welfare.[4] The Department of Agriculture (DoA) is mainly responsible for its inspection and control whereas, extension work at the farm level goes to agricultural extenists at the provincial and districts offices which under the Department of Agricultural Extersion (DoAE). They cooperate to promote the GAP for food crop standard implemented locally to build capacity of smallholder farmer group and individual small scale farmer. [4] Howerver, since 2013, the number of cetified farm is slightly increased, especially at the provincial level, such as Sakon Nakhon province in Northeast Thailand which is the major area of tomato growers in Thailand, there are 9,213 tomato farmers with the total area of 5,259 rai (841.44 ha) but since then there

are only 208 (2.25 %) farms with the total area of 602 (11.44%) rai (96.32 ha) are certified.[1] Therefore, certified tomato farm and their good practices should be lessons learned for the rest. Morever, the cause of not being certified including growers poor understanding of GAP requirements, poor record keeping, low motivation and incentives to implement GAP, [3] lack of agricultural extension services and supportive system,[5] unhygienic practices in production, and inappropriate use of pesticides.[1] Therefore, if the above weaknesses have not been resolved, it may affect the goal of agricultural development that focuses on increasing production efficiency in safe produce of proper quality for consumption by taking into account the environment, worker's health, safety and welfare, lead to create the strength of the farmers institutions And enhance the potential for people in the agricultural sector.[1]

For the reasons mentioned above, agricultural extension approach to good agricultural practice for small-scale tomato farmers in Sakon Nakhon province is needed by study good practices of certified small-scale tomato farmers, 2) develop the agricultural extension approach to good agricultural practice for tomato, and 3) evaluate the implementation of that approach by small-scale tomato farmers in Sakon Nakhon province. By doing this lessons learned from certified tomato farm expanding and disseminating knowledge to both small scale farm and agencies that promote GAP to apply the approach tobe a certified farm which is the primary national standard to develop food production to step into international food standards.

## 2. Material and Methods

This study was conducted in 2014 to 2017. Using a mixed research method, consists of 3 steps as follows,

Step 1, Study of good practices of certified small-scale tomato farmers according to GAP for food crops requirements by studying in 2014. The population is small scale tomato production farm in Sakon Nakhon Province 9,213 farms was purposived sampling of 8 farms to obtain lessons learned by using in-depth interviews and farm visit. Content analysis was use to obtain good practices according to the criteria of the GAP for food crop standard consists of eight key elements as 1) water 2) planting area 3) pesticides 4) pre-harvest quality management 5) harvest and postharvest handlings 6) holding, moving produce in planting plot, and storage 7) personal hygiene and 8) Record keeping and traceability. Connoisseurship was used to synthesize and organize groups of factors that result in good practices of tomato farm in managing food production according to the GAP standards (TAS 9001-2013). [4]

Step 2, Develop the agricultural extension approach to good agricultural practice for tomato, in 2015 by applying the study results Step 1 to organize the connoisseurship by using

expert group seminar to determine the draft the agricultural extension approach to good agricultural practice for tomato, including identify step to operation using content analysis method.

Step 3, Trial the agricultural extension approach to good agricultural practice for tomato. Study in 2016 to 2017 by using semi-experimental with 6 volunteer small-scale tomato farmers. Data analysis uses the evaluation according to the assessment to certify the GAP for food crops (TAS 9001-2013). [4]

# 3. Results and Discussions

## A. Good practices of certified small-scale tomato farmers according to GAP for food crops.

The results of the connoisseurship found that factors that result in good practices of small-scale tomato farmers to comply with the GAP for food crops standard resulting from the following 4 factors:

1) Leadership, is important in the success of small scale tomato farmer because community leaders or farmer group focus on food production in accordance with standards, ability to transfer knowledge to members and other farmers to understand the process of requesting certification, and also as a good source of information to contact the extension agencies that is corresponds to the concept of participatory management style of Lichart [2] that executives or group leaders will set up a common purpose, accept members' comments, progress assessment and has 2-way communication, making it an effective leader and also finding higher productivity[2] as well, which is consistent with Piyachint[5] found that the leaders who lack of knowledge and skills in organizational management, both in production and marketing, directly affect the group's failure.

2) Community farmer group, help to promote the success of the farmer group by participation as well as constantly pursuing learning in self and group development. As a member of the farmer group has advantage in sharing all resources of both in cash and in kinds. [2] In accordance with Piyachint [5] that summarizes the factors that are effective towards community enterprise development for self-reliance are participation, sacrifice, unity, cooperation of members and families directly affecting the success of the group.

3) Resources, the appropriate resources management of the farmer group leads to the success and resources is also one of the 7 key elements of community enterprises that must have and emphasize the use of capital, raw materials, resources and labor within the community which towards self-reliance. [1]

4) extension, the extension and support from the agencies to create learning and group development especially the opportunity to learn and participate by practicing for self-learning are important which corresponds to John's Dewey learning concept, who said that learning was based on the actual practice of learners that is learning by doing[2] and in accordance with Department of Agriculture[1] pointed that the success of community farmer group in food production must be implemented as continuous to make the learning process step by step in order for food growers to begin accepting decisions and changing practices that are consistent with Roger's acceptance theory that says accepting innovation is a process that takes place in a person by acting on their own or together with the collection of experiences from others to be processed to make decisions for acceptance to Direk [2]. Piyachint[5] found that academic services from educational institutions and universities both in the area and outside are one of the factors that affect the success of farmer group including the participation of scholars, [5] making farmer groups develop faster without needing to develop repeatedly follow the steps when having enough potential but must not be too leapfrog by consider the readiness of the group in terms of resources in 4 areas[5] (human resources, finance, raw materials and management).

**B. Develop the agricultural extension approach to good agricultural practice for tomato.**

Based on the connoisseurship the agricultural extension approach to good agricultural practice for tomato was the participatory agricultural extension approach to good agricultural practice for tomato (PAE to GAP for tomato) which comprise with 3 elements as follows

1) P: Participation of small-scale tomato farmer to review of production results to know themselves, to know the world, to plan the production and determine the solution to the problem by using the self-learning process.

2) AE: Agricultural Extension, extension and development of participatory small-scale tomato farmer by self-practice (learning by doing), with 5 roles of extension agencies as (1) sponsor (2) consultant (3) coordinator (4) instructor and (5) mentor to extension and develop small-scale tomato farmer to be self-reliant.

3) to GAP: By using the participatory agricultural extension approach to good agricultural practice for tomato (PAE to GAP for tomato) small-scale tomato farmer and community tomato group practice of eight key elements as 1) water 2) planting area 3) pesticides 4) pre-harvest quality management 5) harvest and postharvest handlings 6) holding, moving produce in planting plot, and storage 7) personal hygiene and 8) record keeping and traceability complied to the GAP for food crops.

Implementing the the participatory agricultural extension approach to good agricultural practice for tomato (PAE to GAP for tomato) should be done continuously in 5 steps including

**Step 1**: Establish the PAE to GAP for tomato team using an integrated working principle.

**Step 2**: Selecting target small-scale tomato farmer and community tomato group to set goals and create a collaborative plan.

**Step 3**: On farm extension and development of GAP for food crops at the farm level by farmer self-practice (learning by doing).

**Step 4**: Participatory evaluation Continuously

**Step 5**: Certification of GAP for food crops.

Development of the participatory agricultural extension approach to good agricultural practice for tomato (PAE to GAP for tomato) in accordance with the transformation of the agricultural development and promotion paradigm that focuses on the important philosophy[2] is 1) every human has the potential when receiving the opportunity, 2) helping him to help himself and 3) learning from doing (Learning by doing) and using integrated role between the target farmer or group who are actor and the extension officers, they are supporters.

**C. Trial the agricultural extension approach to good agricultural practice for tomato.**

The implementation of the PAE to GAP for tomato approach at the farm level of 6 voluntary small-scale tomato farmers found that the pre-test and post-test scores of all farmers practices were significantly different at $P<0.05$ in all provision of GAP and complied with the GAP standard as shown in Table 1.

**Table 1**. Pre and post evaluation of the control groups and the treatment groups apply the PAE to GAP for tomato approach.

| GAP for food crops provision | Control groups | | | | | Treatment groups | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Mean | | S.D. | | t-values | Mean | | S.D. | | t-values |
| | Pre | Post | Pre | Pre | | Pre | Post | Pre | Post | |
| **1.water** | 4.00 | 6.33 | 1.00 | 1.15 | .192 | 3.67 | 14.00 | 0.58 | 0.00 | .001* |
| **2.planting area** | **5.67** | **7.00** | **0.58** | **0.00** | **.057** | **4.67** | **10.67** | **0.58** | **0.00** | **.003*** |
| **3. pesticides** | **11.00** | **11.33** | **1.00** | **1.15** | **.423** | **11.00** | **19.00** | **1.00** | **1.00** | **.005*** |
| **4.pre-harvest management** | **10.33** | **10.67** | **0.58** | **1.15** | **.742** | **12.33** | **18.00** | **0.58** | **0.00** | **.003*** |
| **5.post-harvest handlings** | **5.67** | **6.33** | **0.58** | **0.58** | **.184** | **7.00** | **13.33** | **1.00** | **1.15** | **.034*** |
| **6.moving produce** | **5.00** | **6.33** | **1.00** | **0.58** | **.184** | **7.33** | **9.00** | **0.58** | **0.00** | **.038*** |
| **7.personal hygiene** | **4.67** | **5.00** | **0.58** | **0.00** | **.423** | **5.00** | **7.33** | **0.00** | **0.58** | **.020*** |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **8.record keeping and traceability** | **10.33** | **10.67** | **0.58** | **0.58** | **.423** | **11.67** | **19.67** | **3.79** | **0.58** | **.031*** |

** significantly different at P<0.05*

# 4. Conclusions

From factors that result in good practices of small-scale tomato farmers to comply with the GAP for food crops standard resulting from four factors including (1) leadership, (2) community farmer group, (3) resources and (4) extension. The agricultural extension approach to good agricultural practice for tomato was the participatory agricultural extension approach to good agricultural practice for tomato (PAE to GAP for tomato). The implementation of the PAE to GAP for tomato approach at the farm level of 6 voluntary farmers found that the pre-test and post-test scores of all farmers practices were significantly different at P<0.05 in all provision of GAP and complied with the GAP standard. Further study the implementation of the PAE to GAP for tomato approach to small-scale tomato farmers in other provinces is suggested.

# Acknowledgments

Thank you to Sakon Nakhon Rajabhat University for granting scholarships and thanked extension and development agencies and small-scale tomato farmer and community tomato group in Sakon Nakhon province that cooperate in research studies.

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Thai)

# Analysis of the Performance Skills of Color Language in Digital Photography Aesthetics

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## Abstract

With the advance of digital technology, digital photography has rapidly become a part of our daily living in recent years. As an important manifestation of visual communication, it expresses the thoughts and feelings of people by the characteristics such as virtual, intuition, and image. Its unique function of image dissemination information has also become a borderless language. However, Color is a vital factor in the form of performance in digital photography, which plays a role in the style and situation expression of creative works. Based on the theory of color language, the main purpose of this study is to explore the influence and importance of color image on digital photography using the method of literature review and analysis of digital photography. After analyzing the samples of creative works, it was found that color was indeed an important factor in the form of expression in digital photography. Therefore, it was suggested that the creator should be better to take the emotional image of the picture colors as the basis and give priority to the composition of color image.

**Keywords:** Color Terms, Digital Photography, Symbol, Color Image.

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# 1. Introduction

Photography is a skill that combines technology with art. To engage in the creation of photography, we need not only possess photographic technology, but also have somewhat artistic knowledge and connotation. Simply, photographic creation is presented in a unique form of the art of light and shadow, which makes the audiences deeply impressed. Several reports indicate that color is one of the most important constituent elements in the composition of photographic creation. It can also transmit the particular situation and make a good impression of the picture excluding displaying the appearance of things which are photographed. Based on theory, the formation of color is a simple phenomenon of physics. It is a kind of reflection and/or transmission of light in the nature, projected into the mind via visual observation. Color itself does not have any emotion and perceptual factors such as cold, warm, heavy, etc. However, people always combine the color with the mental feeling and further produce the emotion, even imparting colors with the meaning of culture and spirit value through the ocular characteristic of color. Due to the differences including era, environment, region, race, and belief, a simple color will relate deeper thought and much more complicated meaning (2). For example, red is a kind of joyous and festival color throughout China.

In other words, each color existed in the creation is not accidental, but a kind of artistic beauty created carefully by the creator. It is also a subjective expression of aesthetic. Photographic creators even express their inner feelings via different colors in the work, and show their mood and personality of creativity. Therefore, the main purpose of this study is to explore the influence and importance of color image on digital photography by means of literature review and analysis of digital photography.

# 2. Literature review

Photographic technique has happened many different changes since Daguerre, a French physicist, invented it in 1838 (7). In particular, digital photography with digital imaging devices has converted the optical image into digital record message and also changed the presentation style of the image in recent years. The digital camera therefore has the function of designing (1, 5). Nowadays, digital photography has created a lot of colorful images, affecting the interpretation of the visual sense of people.

As shown in Fig. 1, the process of light passing through the eyes to produce the consciousness of color is generally divided into three stages. The first is the physical stage, which is the nature and quantity of light. The second is the physiological stage, in which the visual cells produce the corresponding light and color, which are then transmitted to the brain.

The third is the psychological stage, which is the change of psychological consciousness when receiving light (9, 10). Briefly, color perception result in the complex combination of different responses of the three procedures above.

However, several reports clearly showed people to have different perception of color. Because of the different stimuli of colors, the effects also resulted in the differences. It can be roughly divided into: 1) the visual cognitive function of color, such as visibility, readability and attention; 2) the judging function of color perception, such as the judgment of color temperature, distance, positivity and negativity. Several researchers considered that the psychological effects of color mostly result from gender, age, life, culture and other factors. Most of the difference comes from different psychological reactions (4). Therefore, numerous conceptual associations often affect color perceptions of people including hobbies, prejudices, and images. If a single color is one or more concepts, then the concept of combining with color, or various concepts induced by color, can be termed color association (6). The content of color association can be divided into two types: one is to associate specific objects, such as bananas from yellow, fires from red, and sky from blue; the other is to associate abstract ideas or emotions. For example, white relates purity, red relates passion, and purple relates mystery. If such abstract associations become common experiences and responses, they will solidify the unique expression of color, and gradually establish its conceptual significance, which is called color image (3).

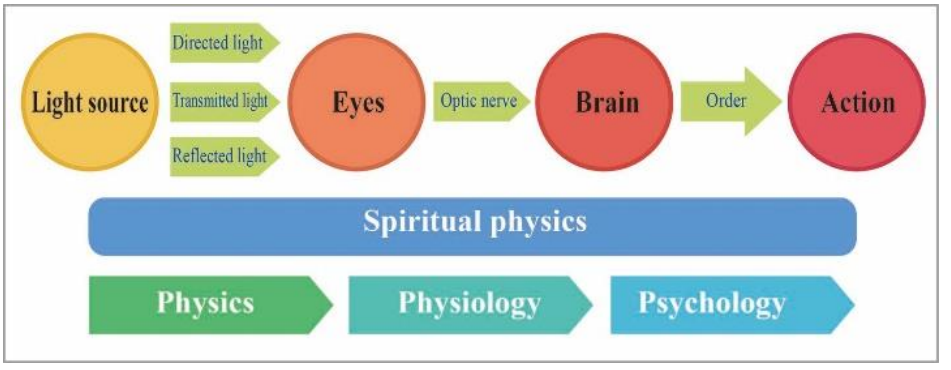



Fig. 1. Diagram of color perception process, which was modified from Wu & Chen, 2015; Wu et al., 2018.

## 3. Cases analysis of digital photographic creation

The main assessment steps of this study were literature review and color analysis of digital photographic creation. The literature was first summarized according to the theory of color. The color code of digital photographic creation was then recorded by using a public program of color selection tool retrieved from website (https://www.ginifab.com.tw/tools/colors/color_picker_from_image.php). Only color codes of RGB and HEX were used in this study. RGB

referred to the three primary light modes, consisting of red, green and blue light. The various color light could be produced by combining three kinds of monochrome light of RGB in different proportions. HEX color (16-bit color), in HTML & CSS system, represented the color labeling of 16-bit code and begins with a # sign, followed by 6-digits. Briefly, the color labeling of 16-bit code in HTML & CSS system was divided into three groups of numbers, and each 2-digits represented a color, as shown in figure 2.

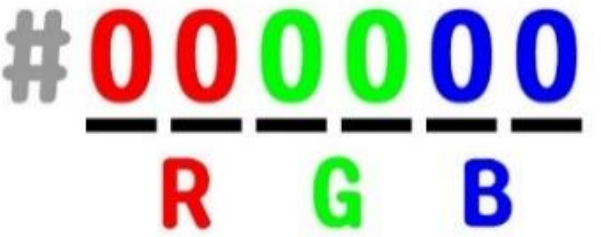



Fig. 2. Diagram of HEX color. #: the sign of beginning code; 00: 2-digits code.

The choice of theme of creative samples was oriented by the symbols and images of color. William J. Mitchell once said “if the digital technology is separated from the humanities, it will lose its meaning” (8). Therefore, through the style and quantitative analysis of color language presented in digital works, it could effectively convey the importance of color to the style and connotation of digital photography.

Generally, red is easy to attract attention and has a better visual effect. It is also widely used in various media and has the impression of vitality, enthusiasm, warmth and progress. In our daily life, people are accustomed to red color as a symbol of excitement and joy. However, the surfaces of fire and blood are red color, such red is also regarded as a symbol of danger, disaster and terror (Table 1). The color of orange is a secondary pigment mixed with red and yellow. The penetration of orange in air is second next to red, and it is warmer than red. Bright orange can give us a sense of dignity, belonging to the psychological color. It can also be used as a festive, rich color, such as many decorations in the palace. Orange has a high visibility. In industrial safety color, orange is a warning color, such as locomotive, mountaineering clothing, and life jacket. Because of its brightness and glare, sometimes people have negative and vulgar images. Orange is also easy to cause visual fatigue (Table 2). However, yellow light is produced by mixing red and green light, and its complementary color is blue. Yellow has hard to distinguish the characteristics containing the feelings of light, thin, and weak. The yellow objects irradiated with the yellow light will be discolored. Its symbol is of acerbity, morbidity and abnormality. When using dark color to contrast yellow, it can enhance the visual effect. Yellow light has a strong sense of light, giving people the impression of light, brilliance,

lightness and purity (Table 3).

Table 1. Red

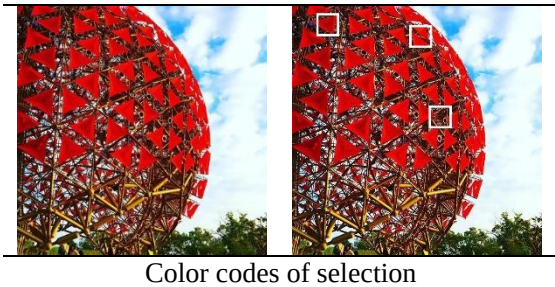
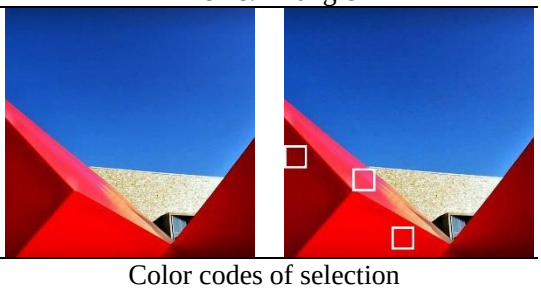
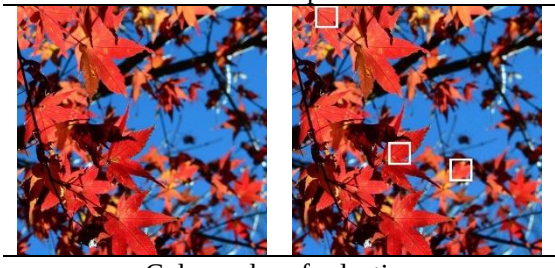
| Theme: Listen to the flowers | Theme: Triangle |
|---|---|
|  |  |
| Color codes of selection | Color codes of selection |
| HEX #aa030a，RGB (170,3,10) | HEX #860100、RGB (134,1,0) |
| HEX #e6080c，RGB (230,8,12) | HEX #fd3f67、RGB (253,63,103) |
| HEX #391513、RGB (57,21,19) | HEX #f50101、RGB (245,1,1) |

Table 2. Orange

| Theme: Maple red | Theme: Sector garage |
|---|---|
|  |  |
| Color codes of selection | Color codes of selection |
| HEX #fd4f46、RGB (253,79,70) | HEX #e8742f、RGB (232,116,47) |
| HEX #e1201b、RGB (225,32,27) | HEX #a7240f、RGB (167,36,15) |
| HEX #fc4134、RGB (252,65,52) | HEX #d28f3f、RGB (210,143,63) |

Green is a common color in nature. The green of plants comes from chlorophyll. The opposite color to green is magenta, not red as traditionally thought. Green conveys the image of refreshment, ideal, hope and growth, which meets the demands of color used in service industry and health care industry. In order to avoid eye fatigue in factories, many working machines adopt green. In general, medical institutions often use green to make spatial color planning (Table 4).

The bright sky blue symbolizes hope and ideal, whereas dark blue means honesty, trust and authority. Normal blue and sapphire blue bring firmness and intelligence in enthusiasm; light blue and pink blue can relax. The complementary color of blue is yellow. Because of its nature of calm, blue has a rational and accurate image. In the design, most of the products that emphasize science and technology and efficiency use blue as the standard color of corporate image, such as computers, cars, photographic equipment and so on. Influenced by western

culture, blue image also represents melancholy and is used in literary works (Table 5).

Table 3. Yellow

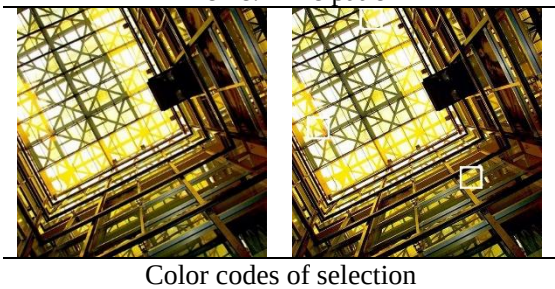
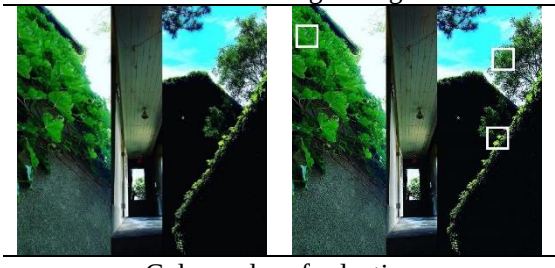
| Theme: Time patio | Theme: Camellia under winter sunshine |
|---|---|
|  |  |
| Color codes of selection | Color codes of selection |
| HEX #fbed4b、RGB (251,237,75) | HEX #fac414、RGB (250,196,20) |
| HEX #faca16、RGB (250,202,22) | HEX #fce775、RGB (252,231,117) |
| HEX #d49c08、RGB (212,156,8) | HEX #cb7a05、RGB (203,122,5) |

Table 4. Green

| Theme: Passing through | Theme: Winter sunshine |
|---|---|
|  |  |
| Color codes of selection | Color codes of selection |
| HEX #259326、RGB (37,147,38) | HEX #2e6709、RGB (46,103,9) |
| HEX #1e411e、RGB (30,65,30) | HEX #bbe616、RGB (187,230,22) |
| HEX #99d63a、RGB (153,214,58) | HEX #9fce02、RGB (159,206,2) |

The light-wave of purple is the shortest, rarely seen in nature. Therefore, it is extended to symbolize the noble color. Purple is a non-perceptual color, symbolizing piety, mystery and loneliness. It is also an elegant, romantic color with philosophical temperament. The romance of purple, with noble, mysterious, and unattainable feeling; dark purple, brilliant purple is charming, gorgeous and romantic (Table 6). Besides, black symbolizes death, evil, seriousness, and mystery. Black is regarded as the color of heaven in the Book of Changes of China, which is called "heaven and ground are dark and yellow". Black has a noble, stable, technological image. Many scientific and technological products are mostly used in black color. Grey has a soft and elegant image. When using grey, most of them use different levels of change to combine white with high-level, scientific and technological images. They usually need to be used with other colors. The light of three primary colors in the spectrum: red, blue and green are mixed in a certain proportion to produce white light. It is usually considered "colorless",

with the highest brightness and nil hue. Pure white will have a cold, severe feeling. When using white, it is recommended by adding some other colors, so that it will not be too dull (Table 7).

Table 5. Blue

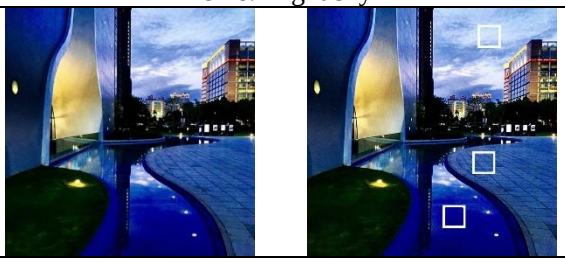
| Theme: Night sky | Theme: Look up |
|---|---|
|  |  |
| Color codes of selection | Color codes of selection |
| HEX #cedffa，RGB (206,223,250) | HEX #1082fd，RGB (16,130,253) |
| HEX #375fae，RGB (55,95,174) | HEX #2cb1ff，RGB (44,177,255) |
| HEX #010083，RGB (1,0,131) | HEX #0651f8，RGB (6,81,248) |

Table 6. Purple

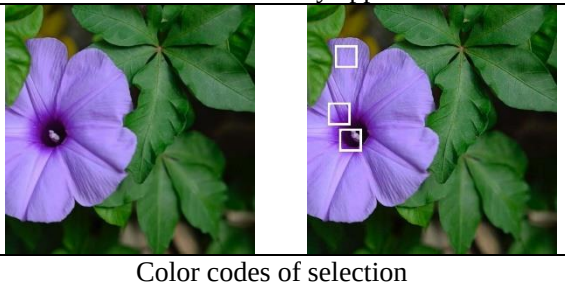
| Theme: Suddenly appear | Theme: Small-leaved Barringtonia |
|---|---|
|  |  |
| Color codes of selection | Color codes of selection |
| HEX #ab92ee、RGB (171,146,238) | HEX #8230c6、RGB (130,48,198) |
| HEX #7e34cd、RGB (126,52,205) | HEX #ba28ab、RGB (186,40,171) |
| HEX #69179c、RGB (105,23,156) | HEX #c6a9fc、RGB (198,169,252) |

Table 7. Black gray

| Theme: Geometry | Theme: Snowfield of high mountain |
|---|---|
|  |  |
| Color codes of selection | Color codes of selection |
| HEX #bad7da、RGB (186,215,218) | HEX #d5dbf1、RGB (213,219,241) |
| HEX #173f2f、RGB (23,63,47) | HEX #e3e8f6、RGB (227,232,246) |
| HEX #010005、RGB (1,0,5) | HEX #7b90b3、RGB (123,144,179) |

# 4. Conclusion

In short, color is not only a simple tone, but also contains many characteristics. Through the association of color image, each creation of digital photography creation can convey the concepts, thoughts and metaphorical messages carefully exhibited by the creator. When the creators apply digital photography technology through the methods of visual composition design and aesthetic connotation of color image, and properly guide the viewer's vision to the psychological level to appreciate the work, the processes of creation and works will be much more touching and resonant. Therefore, based on the emotional image of digital photographic creation, color image has high priority in the visual composition of each work.

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# A Debate between Modernization Theory and Dependency Theory on Development: Taiwan as a Case Study

Nguyen Mai Lan Thanh*

## Abstract

Despite being a small island with few natural resources, often hit by natural disasters and had a low starting point with millions of people living in poverty in the 1950s, only after forty years, Taiwan took off, became a dragon and democratized. Consequently, it comes as no surprise that many researchers have conducted their studies on this region. The purpose of this paper is indeed theory testing, as the author would like to examine the validity of both modernization theory and dependency theory on Taiwan's development. The reason for the author to choose these two theories is because that modernization is one of the most prominent theories of development in political economy theories, while dependency theory represents one among immediate criticisms to it, both of which can apply to the case of Taiwan. Thereupon, this manuscript (1) makes a substantial contribution to the conception and design of the two theories in the existing literature, (2) opens up the debate (of the two theories) to a specific case (Taiwan), and (3) leaves room for further studies on Taiwan's development in similar theoretical frameworks.

**Keywords:** Taiwan, Modernization, Dependency Theory, Political Economy Theories, Development.

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# 1. Introduction

After forty years, from an island in poverty and backwardness Taiwan has developed into an "Asian dragon[1]" in economics. Among the significant events in the world in the last decades of the 20th century, the process of democratization in Taiwan is recognized as one of the most successful cases. Remarkably, the country moved from an authoritarian political system, a one-party to a multi-party system while there was not any considerable economic and social turmoil, when compared to many other developing countries.

The purpose of this study is indeed theory testing, as the author would like to examine the validity of both modernization theory and dependency theory on Taiwan's development. In other words, the main research question of this paper is, "To what extent do modernization theory and dependency theory explain the development in Taiwan?" The reason the author chose these two theories is because that modernization is one of the most prominent theories of development in comparative politics, and dependency theory represents one among immediate criticisms to it. If modernization theory explains why some countries are developed in terms of their economy and their political systems while others are not, dependency theory answers to the question of why there are underdeveloped countries and why they stay as underdeveloped. In this paper, Taiwan's democratization or development will be analyzed from these two angles.

To understand fully the two perspectives as well as the context of the case this paper attempts to study, section two will define the basic concepts as well as describe an overall framework of the two theories. Then section three analyzes to what extent democratic transition in Taiwan can be explained with modernization theory. Accordingly, section four proposes Taiwan as a deviant case to dependency theory among other Third World countries. Finally, section five concludes the paper.

# 2. Conceptual and Theoretical Framework

First of all, there are two major concepts of this paper: development and democracy. The concept "development" has actually several definitions and controversial measurement techniques. With regard to the scope of this study, I shall limit in this paper two dimensions of development: political development and economic development, which are different things according to Huntington (1965). In this paper, development, therefore, refers to both economic development and democracy as the desired outcome. The second main concept of the paper is

[1] Taiwan, Hongkong, Singapore and South Korea as a result of miraculous industrialization with sustainable high economic growth rate and successful democratization between mid-1950s and 1990s are regarded as the four "Asian tigers" or "Asian dragons."

democracy of which definition is that formulated by Diamond et al. (1989) and Dahl's polyarchy (1971). Democracy, consequently, refers to a political system, which satisfies a set of conditions of the minimalist approach - electoral democracy: free and fair election, competition among political parties, inclusiveness or political participation, and civil societies to ensure these two. Since December 1989 elections, Taiwan has met these conditions, hence worth a case study.

## 3. An application of modernization theory to Taiwan case

As can be seen then, Taiwan's democratic transition is actually a part of "the Third Wave" of democratization as called by Huntington (1993) in the East Asian region along with South Korea and Thailand (Diamond et al. 1989, 1), as well as other countries in the world. With regard to Taiwan, especially, classical modernization theory whose pioneer is Martin Lipset, seems to prosper as it uses economic determinant as a predictor to democratic stability. In other words, Lipset suggests that political development, or democracy, is likely to increase as socioeconomic factors improve (Lipset 1959). He identifies two indicators of economic development as crucial in keeping democracy stable: education and the middle class. In addition, his understanding of political development is democratic stability which is measured by uninterrupted democracy, or uninterrupted presence of elections. By the same token, Deutsch (1961) takes modernization as an independent variable and political development or democratization as a dependent variable. For Deutsch, democratization means responsiveness of the state. Deutsch explains that modernization involves changes in the external conditions of people. Modernization starts with industrialization, urbanization, increase in education, media exposure and diverse social surrounding. People need social security, healthcare services, and educational services in their new environment. Due to pressures coming from societies to satisfy their needs, now the state should respond to their needs. Political development is the increase in capacities of the state to respond to these needs of the people. To be able to satisfy educational needs, social security needs, the state needs to extract resources from people, without taxes people's needs cannot be satisfied. To Deutsch, the essence of democracy is responsiveness to people's needs.

*Does Taiwan fit modernization theory?*

With regard to the abovementioned arguments, the fact that Taiwan's socioeconomic progress with democratic transition seems to fit well modernization theory (Soong 1992). First of all, democratization in Taiwan is not a revolutionary, but a transformation in the framework of existing law, peaceful and normal. In history, a revolution occurred in the violence spreading

and violence recurs regularly, the ability to build a democracy was less likely to happen. These revolutions or regime change occurring in violence often lead to further of a dictatorship to another dictatorship (O'donnell and Schmitter 2013, 11). Therefore, in this respect, Taiwan is different from those late industrialized countries in the process of democratization, but more similar to that path of the Western countries.

Besides, Taiwan's democratization process was preceded by a process of liberalization since the 1970s. This is the struggle for political rights from rapid economic development that confirmed with Lipset's argument. Taiwan may be seen as a special case of socioeconomic transformation, which is complicated by the impact of mutual growth policies and anti-poverty policies towards modernization path. To illustrate, poverty alleviation programs shown in policies and plans specifically focused on agricultural development, construction, irrigation to ensure manufacturing operations and meet the needs of structural transformation, food security, etc. by effectively utilizing poverty aid from the government and the civil society. Therefore, the living conditions of the rural population has seen positive changes over 20 years especially the ability to ensure food, increasing per capita income and ability to offer new services.

To sum up, it can be concluded that modernization theory quite well confirms with the political development in Taiwan, which occurred with the economic development of the country, the functioning democratic opposition groups to push for political reforms, and the institutions to channel interests of individuals to have a high level of political participation. Nevertheless, by the same token, these aforementioned explanatory variables constitute the criticisms to the theory by dependency theorists with regard to the causes of the state's development.

## 4. Taiwan as a challenge to dependency theory

To begin with, the majority leaders of the southern countries or least developed countries in Africa, Latin America, and Asia - were not simply dependent on the target standard model of modernization theory. In many southern countries, the leaders were trying to separate the technical aspects of the modernization of the economy. The very case is Latin America neo-Marxist dependency theories in the 1970s as a reaction to modernization theory on the situations of inequality in structured exchange between exporters of raw materials and industrialized countries. In this case the inequality is seen as the cause of underdevelopment and disrupts the formation of a stable background of modernization theory. That is, development of a (developed) country in the core is based on the underdevelopment of the periphery. In other words, dependency theorists claim that capitalism in the world scale resulted in the Third World (periphery)'s dependence upon the advanced capitalist countries (the core).

Apparently, there are primarily two schools of thought within the dependency theory. One school is called American-Marxist for their ideas are based on Marxism. Andre Gunder Frank calls this external constraint on development. That is, the core requires underdevelopment in the periphery (Frank 1966). The second school of dependency theory is called the Latin American-Structuralism, advocated by Cardoso and Falleto, or later Wallerstein called it World System Theory. This school of thought adds another aspect to dependency theory called semi-periphery. The economic system is the same as in dependency theory – core and periphery, but the semi-periphery has autocratic regimes; they export mature, semi-finished goods and raw materials and import manufactured goods; and they have low welfare services.

In addition, Cardoso and Faletto (1979) argue that internal dependency relations and external structures determine the nature of development. Many countries achieved a transition from the periphery of the semi-periphery between 1960 and 1990. Nevertheless, there is no specific measurement on how countries are classified into which category, whether it is according to the income level of the IMF classification. Second, dependency theory always tries to find someone to accuse of for the country's underdevelopment. Most prominent examples can be found where countries with colonial history. They blamed their underdevelopment as a result of the colonization. However, colonized countries in Latin America and Africa usually blamed British colonization but what about Malaysia and Hong Kong? They are now advanced and developed quite faster than other former British colonies. The question of who exploits whom is difficult to answer. Apparently, if a particular state is next to some advanced countries, that state will get some know-how. This is the case of Taiwan and the advancement of a periphery country toward semi-periphery.

Predominantly, the bourgeoisie or capitalist classes in Taiwan were not strong enough to influence the policy making as compared to Latin American countries. During the time of colonization by Japan, the economy was controlled by the colonizer and hence, those bourgeoisie had little role in the market. After 1945, not many bourgeoisies were left; however, a number of MNCs began to invest heavily FDI in this island along with other East Asian countries. This was not the case in Latin America because MNCs there, which had connections with the comprador elites, under the bureaucratic authoritarian regime, did not only dominate the leaders but also the society. In Taiwan and other emerging East Asian countries, there were no such MNCs and domination. As a consequence, the authoritarian governments were left free to govern their countries as well as control the economy.

Furthermore, after the Japanese colonialism period, Taiwan did not have any manufactured goods, and hence, had to import capital goods from the core. That is to say, Taiwan was a

dependent economy too. In addition, with the U.S pressure, Taiwan was certainly operating her economy in a closed-door regime. It is worth notifying that during the 1950s and 1960s, Taiwan pursued import substitution policies to protect domestic economy, and enforce the self-sufficiency as well as security from main land China that can easily exploit the economy of Taiwan. Moreover, in the same period, Taiwan was dependent on the U.S massive economic aid while domestic market became increasingly saturating. Eventually, the Chiang government opened its market and followed export - oriented industrialization since 1960.

Even though experiencing heavy dependence on the large states or the core, it could not prevent Taiwan from using self-reliance measures to develop the country. One of such effective policies is land reform, which was successfully carried out by the Japanese during the colonial period. Two differences are found in this dependency of Taiwan on Japan, which were not the case in Latin American and other Third World countries. First, the colonizer, or the one upon which Taiwan was dependent, which was Japanese administration at that time, structured the reform in such a way that the by-product was created: traditional landlordism remained intact, a more effective way of farming technology were introduced and practiced widely (Ho 1971, Amsden 1979, Wickberg 1970). If in Latin America the land reforms and other attempts of economic reforms were undermined by the economic inequality as a result of previous colonial period, in 1950s, Taiwan's land reform program improves economic equality among the society. Therefore, such reforms do not result in instability or social rebellion and political disorder due to economic inequality (Chan 1990, 69, Huntington 2006, 378) like in Latin America.

Another evidence that proves Taiwan's dependence on the U.S but still developed is what occurred during the 1989s. The government was then under Lee Teng-hui, the extraordinary leader who led Taiwan to both economic and political development smoothly. Following the export-oriented industrialization regime, Lee further opened domestic markets to foreign investments with protection and guarantee for patented issues, as well as aggressively inherited technological know-how from developed countries such as the U.S and Japan. As Lin (1973) claims, Taiwan is possibly the most liberal state which opened her economy to global market. These actions were taken as a reaction to the U.S pressure yet demonstrated the ability of Taiwan to compete with other industrialized democracies. In other words, this shows the process of Taiwan moving from periphery to semi-periphery status.

On its merits, the important point this paper endeavors to point out is that Taiwan being a deviant case of dependency theory does not necessarily prove the irrelevance of the theory today for a number of reasons. First of all, dependent state can become independently developed only with essential internal restructuring within the state such as Taiwan and the

other Asian miracles. In other words, the experiences are not necessarily universally applicable (Sautter 1985). Second, only if the country decides to integrate in the world market could it prove the escape of the peripheral status. Third, as explained above, the structural composition of the society is the very key factor, which differentiates the possibility of independent development between Taiwan and, say, Latin American countries. Similarly, just like in Taiwan in the 1980s when domestic market power shrank, the self-reliance policy could no longer be implemented. Finally, there are still a number of underdeveloped or countries which are still in the periphery in the world. Although dependency theory was claimed by many scholars obsolete due to lack of appealing power in today's world, the author believes that, at least, the structural dependency school can still be valid.

# 5. Conclusions

Taiwan is a special case to study modernization theory and dependency theory. It seems that the first one has been confirmed in the case of Taiwan and the latter is still valid today even though Taiwan proves a deviant example of which. Apparently, there are many assertions that democracy is only in accordance with European and Western values. Even some leaders in Asia claim that the "Asian values" and the value of Western-style democracy are not competent. Taiwan is, with regard to the analysis from the two theories' lens, a testament that democracy can be developed in a common way in Asia, and democracy is not unique to only one culture. Such finding from this paper leaves room for more discussion about Taiwan's development from different theoretical perspectives with respect to explaining similar causal relationship with democracy being the desired outcome. Besides, the methodology used in this paper could be improved by employing grounded theory which combined qualitative and quantitative methods of data analysis that would strengthen the methodological quality of case study research.

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# A Study on the Attractive Factors of "Taipei in Motion": the Internet Advertisement of the Taipei 2017 Summer Universiade

Chun-Wei Ke*, Rain Chen, Hung-Yuan Chen,
Yu-Chin Hsiao

## Abstract

The Taipei 2017 Summer Universiade was huge box office hit. In the meanwhile, advertisement plays an important part to promote the event. The "Taipei in Motion", one of the internet advertisement of the Taipei 2017 Summer Universiade, was highly praised and won the 2017 Red Dot Design Award. Therefore, this study explores its attractive factors and identifies the reasons why it attracted public attention? In order to determine the attractive factors of the "Taipei in Motion", the study applied the concept of Miryoku Engineering and Evaluation Grid Method (EGM). The study analyzes attractive factors based on in-depth interviews, and builds the evaluation hierarchical diagram. The results show that seven original factors contributed to the success of "Taipei in Motion": camera movement, transitions effects, visual effects, music and sound effects, featured attractions, characters, competition information. In addition, the study also obtains 19 concrete elements, "Temple Culture in Taipei" for the most influential factor, and the top three abstract elements – "fast", "nervous", and "immersive" – which are influenced by the concrete factors. The conclusion of the study will contribute ideas to design similar advertisements.

**Keywords:** Internet Advertisement, Attractiveness, Miryoku Engineering, Evaluation Grid Method.

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# 1. Introduction

The Taipei 2017 Summer Universiade was hosted in Taipei of Taiwan first time, which was the highest level of international sporting events of all time in Taiwan. The selling rate of final ticket of the Taipei 2017 Summer Universiade reached 87.7%, which was far beyond that of the previous Summer Universiade and also became the best-selling ever (Executive Yuan, 2018). In addition to supports from Taiwanese, its marketing strategy is a major key to drive the success of the event.

From the promotion aspect of the marketing mix, advertisement plays an important role and is also the main tool to communicate messages to consumers (Lu, 2015；Hsiau et al., 2010). The purposes of advertisement are to convey the information and build the images, which attract consumers' attention through communication (Moriarty et al., 2016). With technology development, the internet has penetrated into people's daily life in many ways and people are becoming more and more inseparable from the internet. Moreover, the internet is also a source of acquiring information. Unlike traditional media (magazine, newspaper, radio, and TV), internet media of today has a number of features, including powerful audiovisual effects, cross-regional, interactivity, watching anytime, anywhere, timely feedback, etc. Therefore, this study chooses the internet advertisement of the Taipei 2017 Summer Universiade as the scope of the study.

In internet advertisement of the Taipei 2017 Summer Universiade, the internet advertisement “Taipei in Motion” was highly praised and won the 2017 Red Dot Design Award. Its click-through rate reached 3.79 million, which was much higher than the other two internet ads – “Taipei, my home” with 1.67 million and “In fact, we are always there” with 1.22 million (Facebook of Taipei 2017 Summer Universiade, visited: 2018/05/30). Thus, this study explores the attractive factors of “Taipei in Motion” and studies the reasons why it gained public attention.

The study applies the concept of Miryoku Engineering, which is a design concept based on consumer preferences and builds a bridge between designers and consumers (Li et al., 2017), to discover the attractive factors of the “Taipei in Motion”. “Miryoku”, a Japanese word, means “power of attractiveness.” “Miryoku Engineering” was developed by Junichiro Sanui and Masao Inui based on the psychological concepts of personal construct theory (Kelly, 1955). It can not only explore the attractiveness of products based on human’s emotions but can also determine the concrete design elements that attract users (Shen, 2013). In 1991, Masato Ujigawa, a Japanese scholar, gathered several scholars to propose the concept of Miryoku

Engineering, which aimed to create attractive products and spaces by adopting a design philosophy centered at consumers' preferences (Li et al., 2017).

The Evaluation Grid Method (EGM) is an important method of Miryoku Engineering, which originated from the Repertory Grid Method (RGM) in psychology. The EGM organizes elements into a chart for analyzing and discussing by the understanding concept of personal cognition (Kelly, 1955). Sanui (1996) advanced it into evaluation grid method in two processes. First phase is to compare objects to be evaluated. Participants are asked to response what is satisfied or unsatisfied and what they prefer or disfavor about them. Second, according to their answers, the meaning or conditions are made clear through supplemental questions. This method can codify their reason into a hierarchical structure.

The EGM had been successfully applied to product design, product development, and other research fields now to thoroughly explore users' inner feelings to extract details of consumers' cognitive structures and to convert them into concrete factors of assessment as a basis of design (Asano, 1998). And the EGM is also widely used in other fields, such as interactive media fields, game fields, social network fields, and toy figurine fields, etc. (Chang & Chen., 2017; Ho & Hou., 2015; Shen., 2013; Chen et al., 2012; Chen & Chen, 2017; Li et al., 2016; Yu & Ho, 2014). Hence, the study adopted the Evaluation Grid Method to obtain attractive factors of the "Taipei in Motion".

# 2. Methods

### 2.1. In-depth interviews using the EGM

In EGM, in-depth interviews are usually conducted to extract inner opinions of interviewees. This study invited 3 participants, aged between 22 and 25, who had studied in visual communication design for more than four years. Because of their academic background in advertising, they are more sensitive to advertisements and lines in a script than those who do not have the background.

In-depth interviews were conducted in a quiet private meeting room so that the interviews would not be disturbed by noises outside. In in-depth interviews, the author, also the interviewer, guided, observed, and recorded the interview process. At the beginning of the interview, participants were asked to watch the video of the "Taipei in Motion" with a headphone. Then, the author conducted interviews with participants. The decision point of ending an interview was when the interviewees couldn't think of other reasons for attractive factors. The process is shown in Figure 1.

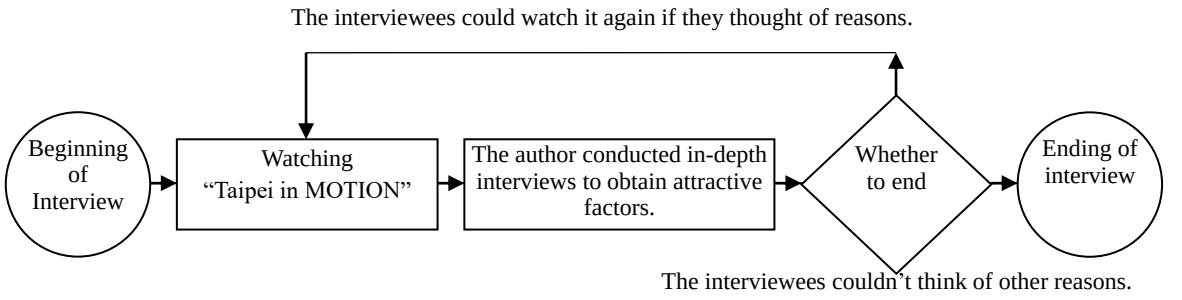


Fig.1. In-depth interviews process

During the in-depth interviews, all the reasons provided from interviewees were classified into upper-level, middle-level, and lower-level. Generally, their first responses classified into the original middle-level items, and then the abstract meanings behind the responses would be the upper-level items. In contrast, the concrete conditions and characteristics derived from the first response constituted the lower-level items (Li et al., 2017), as shown in Figure 2. For example, an interviewee was asked, "What are the reasons that the advertisement attracts you?" The interviewee's first response was "I think visual effects look nice." Therefore, the visual effects of the advertisement were extracted as the original attractive reasons (middle-level items). Then the interviewer further asked the question according the responses provided: "Why do you think the visual effects are attractive?" If the interviewee answered "I like the red-blue beam effect and spot effect," the "red-blue", "beam effect", and "spot effect" would be extracted as the concrete attractive reasons (lower-level items). The interviewer continued to ask, "What aspect of the visual effects attracts you? Could you describe your feelings?" If the interviewee answered "I feel technological and fast," then the reply "technological" and "fast" would be extracted as the abstract attractive reasons (upper-level items).

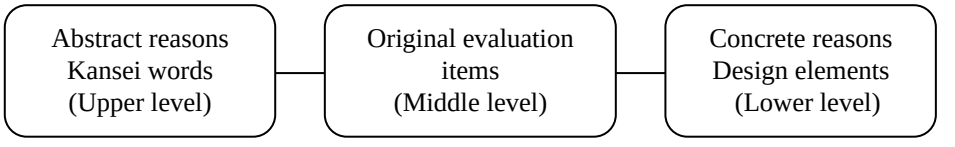


Fig. 2 The hierarchical diagram of the EGM

The evaluation hierarchical diagram was organized based on the results of the in-depth interview. The abstract reasons are on the left side, the original ones in the middle, and the concrete ones on the right side. All reasons are connected with straight lines to demonstrate hierarchical relationships, as shown in Figure 2.

The evaluation hierarchical diagrams for the reasons from three interviewees were organized separately and then integrated 3 diagrams into one. In the process of integrating, the

author combined similar reasons into single items. Moreover, if the interviewees have the same reasons, the frequency of the reason will show on the right next to the reason. For example, “high-speed” and “fast-pace” were combined into an item named “fast 2”.

### 2.2. Organizing an evaluation hierarchical diagram

The evaluation hierarchical diagram was organized based on the results of the in-depth interview. The abstract reasons are on the left side, the original ones in the middle, and the concrete ones on the right side. All reasons are connected with straight lines to demonstrate hierarchical relationships, as shown in Figure 2.

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## 3. Results and Discussions

The final evaluation hierarchical diagram for the “Taipei in Motion” is shown in Figure 3. The diagram helps understand the reasons why the interviewees are attracted by this particular event. In Figure 3, the evaluation hierarchical diagram refers that attractive factors of the “Taipei in Motion” are from seven original factors, including camera movement, transitions effects, visual effects, music and sound effects, featured attractions, characters, and competition information. In addition, a total of 19 concrete reasons are obtained, as shown on the right side of Figure 3. A total of 19 abstract reasons are obtained, as shown on the left side of Figure 3.

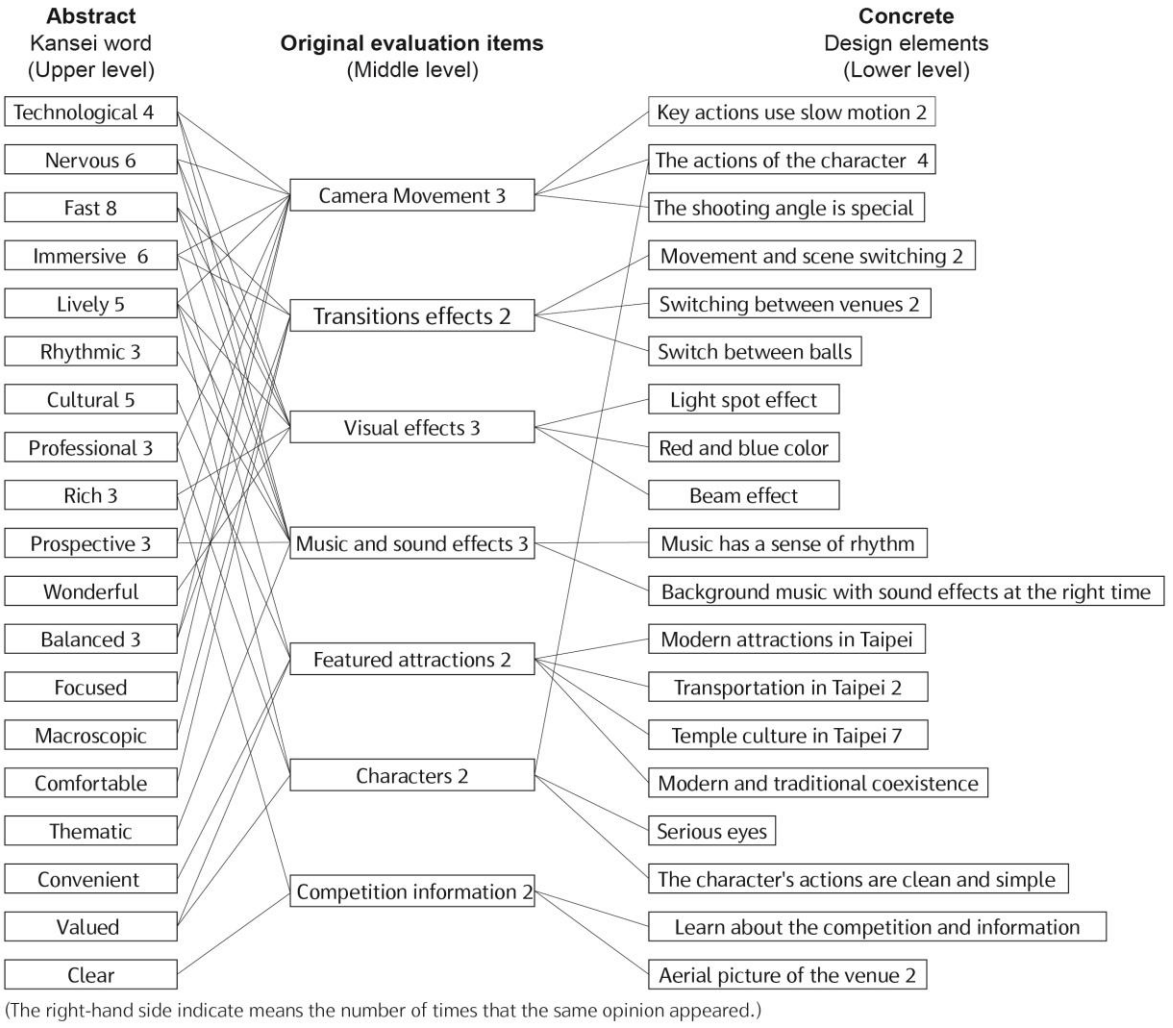


Fig. 3. The evaluation hierarchical diagram of "Taipei in Motion" based on the EGM

This study analyzed seven original factors based on the evaluation hierarchical diagram of the "Taipei in Motion". In camera movement, both fast-pace and slow-paced video shooting techniques applied on the Taipei 2017 Summer Universiade scenes and the city street scenes. Every scene is well-designed to fit into this 90 seconds video, to maximize the value of the advertisement. While watching, audiences would feel the senses of beauty and artistry. Close-up shots on faces and movements of the characters in the video, aerial shots on sport fields and courts, and time-lapse scenes make audiences feel vivid, fast and exciting, as shown in Figure 4.

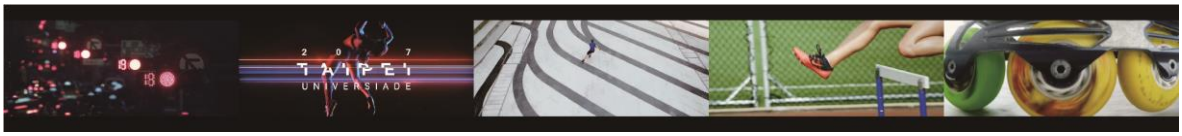


Fig. 4. Camera Movement of "Taipei in Motion"
(quoted from: https://www.youtube.com/watch?v=ZI0yye2yhjg, visited: 2019/01)

In transitions effects, similar angles and shapes of specific movements followed one to another allows audiences feel the video arranged and designed well. For example, the scene of an athlete shooting an arrow followed by the scene of the Taipei MRT rails, which have a similar shape as an arrow, as shown in Figure 5.

Fig. 5. Transitions effects of "Taipei in Motion"
(quoted from: https://www.youtube.com/watch?v=ZI0yye2yhjg, visited: 2019/01)

In visual effects, spot lights in the film and visual effects integrated proficiently makes the scenes of lines and faces rich of streamline and speed. Moreover, using contrasting color – red and blue, the main colors of the Chinese Taipei, gives audiences the sense of exciting, calm, and professional, as shown in Figure 6.

Fig. 6. Visual effects of "Taipei in Motion"
(quoted from: https://www.youtube.com/watch?v=ZI0yye2yhjg, visited: 2019/01)

In music and sound effects, consolidating fast-pace and slow-pace scenes creates a special mood, which is a mixture of fast and slow movements. In addition, using the daily Taipei MRT broadcast and the sound of the casting moon blocks, fortune-telling cups originating from Chinese culture, evoke audiences' inner resonance.

In featured attractions, the scenes are full of urban life in Taipei. The featured attractions are connected with similar movements of the event that give audiences the sense of connection and surprise, such as Taipei 101, Taipei MRT, Taipei street views and so on. Moreover, it brings history and culture of Taiwan and Taipei to audiences. For example, the scenes of Longshan Temple, Cheng-En Gate, and Yuan Shan Hotel, blend a fusion of modernity and tradition, as shown in Figure 7.

Fig. 7. Featured attractions of “Taipei in Motion”
(quoted from: https://www.youtube.com/watch?v=ZI0yye2yhjg, visited: 2019/01)

In characters, using close-up shots on faces and movements of athletes create a feeling of neat and professional that gives audiences positive sentiments on the athletes of the Taipei 2017 Summer Universiade, and even increases their willing to further support them, as shown in Figure 8.

Fig. 8. Characters of “Taipei in Motion”
(quoted from: https://www.youtube.com/watch?v=ZI0yye2yhjg, visited: 2019/01)

In competition information, the video uses a lot of visual elements with aerial filming to capture the awareness of competition, far from traditional advertisements, that makes audiences interested and delivers competition information of the Taipei 2017 Summer Universiade. For example, a swimming pool, tennis courts, basketball courts, and a football field, etc, as shown in Figure 9.

Fig. 9. Competition information of the “Taipei in Motion”
(quoted from: https://www.youtube.com/watch?v=ZI0yye2yhjg, visited: 2019/01)

As analysis provided above, the “Taipei in Motion” reflects Taipei culture and the scenes of Taipei 2017 Summer Universiade by using aesthetic and unique visual effects. It effectively promoted the city of Taipei and the event of Taipei 2017 Summer Universiade. It integrates traditional and modern, rational and emotional, dynamic and static to provide a new visual experience for audiences.

## 4. Conclusions

This study extracts attractive factors of the “Taipei in Motion”, one of the internet

advertisement of the Taipei 2017 Summer Universiade based on the Evaluation Grid Method (EGM). The result refers that the attractive factors of "Taipei in Motion" are from seven original elements (camera movement, transitions effects, visual effects, music, and sound effects, featured attractions, characters, and competition information), 19 concrete reasons, and 19 abstract reasons. These seven original elements help us to understand the main attractive factors of the advertisement. Concrete reasons could serve as design elements for other advertisements. The "Taipei in Motion" doesn't just function as an advertisement, conveying information and building images; it also went viral and became a hot topic. Besides, it is also the main factor to bring the Taipei 2017 Summer Universiade to success, making Taipei and Taiwanese design capabilities on the world stage.

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# An Application of Simple and Small-Capacity Solar Cell Energy-Saving System in Building

Jun-Yu Liu, Chuen-Der Huang*

## Abstract

In present, the way of usage solar energy is to feed the electricity power to the existed power system as part of the overall capacity of power with the low efficacies of solar cells. Besides, the install cost is not cheap enough, for the solar system has to set up main devices while shunt with power system, such as solar cells, enough capacity of inverters, protectors, and other meters to record amount of powers. In this study, the usage of the system is with different thinking that is the system is not shunt with main power system and to get related advantages still.

Therefore, for the small capacity usage, the economic benefit is low so that the establishers should have to consider that before use. In addition, the harmonic waves should be serious discussed due to the used of inverters while the amount of percentage become large enough. The harmonics will make the power pollution. On the other hand, for those low population density areas and far away from power station locations there are other interests in using solar system.

In this article, a simple, low cost, and small capacity solar cell system is mentioned which will provide the energy saving solution and will not affect the original power system by the independence the electricity saving. Moreover, this energy saving system includes a water reused system to achieve the task of energy saving also.

**Keywords:** Solar Cell, Energy-saving, Power Pollution.

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# 1. Introduction

Introduction In early days, the usage of electricity is an index of civilization, the larger number the civilizer. The total used of energy was $5.5\times10^{20}$ joules, or $1.75\times10^{13}$ Watts, in 2015. And in 2016 the total energy consumption in the world are 136.72 billion tons of oil. According to the ‘BP World Energy Statistics’ , the storage of oil in the world are about 1645 billion tons it could be used for more 40years while the natural gas is 65years and the coal is 162 years.

Meanwhile, the environment topics due to the Global warming have paid attention to people. The UN held its first meeting on climate change in early l995, in Berlin, Germany. The meeting adopted the "Berlin Mandate" and launched new talks on strengthening the "UN Framework Convention on Climate Change." The meeting also held the second session in July 1996 at the United Nations Office at Geneva. At the third session in Tokyo Japan, the meeting passed the "Kyoto Protocol", which has called for the developed countries to sign the Protocol to reduce the greenhouse gases emissions at least 5% by the amount of 1990, from 2008 to 2012. In 2015 “Paris Agreement” was signed by UN members to hope to jointly deter the global warming trend. To find the substitute energy which must be sustainable and clean becomes an important and necessary mission. Before the mission is completed, the energy saving works should be taken to protect the circumstance.

It is estimated that half of energy transmitted from sun to earth will be absorbed by atmosphere of earth, but even though, there are about 173,000 TWatts of solar energy per second received by earth. The number is larger than people needs in globe. Therefore, the solar energy is the best choose amount those green energies such as wind power, tidal, geothermal etc., for the convenience and less influence to environment. The energy saving methods must do the energy saving task under the same condition of living level otherwise the methods are not a suitable methods.

In this article, a saving energy house which is suitable for those independent buildings or classic factors especially for those located on far-off area buildings with small capacity of solar cells. Energy loss will be occurred during each convert or transmission therefore reduce times of convert and shorten the transmission length are the basic thinking. Based on this thinking the less of equipments the larger convert efficacy can be obtained, less of inverters and converters. Remove the inverter become the one of choosing, since the inverter is omitted therefore the system should operate on DC system instead of AC. Besides, as mention above, the harmonic wave will be occurred while the DC through the inverter. A main or minor power using concept

also occurred. While the amount of capacity related to the power network is small the effect can be neglected but while the amount accumulated the effect would be paid attention, for it will cause electric pollution for the power net.

In the existed electrical devices, most of them are designed to fit AC power although the appliances are using DC voltage by using transformers and converter to obtain the operational DC voltage. But it is found that the DC electrical machineries are well designed and good for using in control.

# 2. Related Theorems

### 2-1 Solar cell

In fact, the major utility of solar of human can trace back to ancient time, people use the light and heat of sun to do works. People use heat to heat materials such as to dry or to rise temperature, especially to heat water to bath. But there is a contradiction point, in summer people do not need so much hot water to use in bath, while in winter the need is increased. The so called solar water heater does not popular with peoples. As the use of light, for the long periods people use it just in lighting and can not do other progress. This situation has been improved by semiconductors devices, the solar cells have been created to catch the light and transfer to electricity. The basic structure of solar panels is formed by a P-type and a N-type semiconductor bonded together, call as a PN-junction.

When sunlight impinges on the PN-junction, a built-in electric field from N to P will be generated. The generated electrons will be moved to the N-type semiconductor by the electric field and the holes move to the P-type. So charges are accumulated on both sides, an electromotive force occurred then an electric potential can do the electrical works while a lead is use to form the path to let current flow by.

Some types of solar cells divided by the production of materials into silicon-based semiconductor, such as CdTe thin film batteries, CIGS thin film batteries, dye-sensitized thin-film batteries, organic materials. The most important parameter for solar cells is the conversion efficiency. The efficiency of single-crystal silicon cell was 25.0%, poly-silicon cell efficiency was 20.4%, CIGS thin-film cell efficiency was 19.8%, CdTe thin-film cell efficiency was 19.6%, and amorphous silicon (amorphous silicon) thin-film cell efficiency was 10.1%. Obviously, the conversion efficiency is a breakthrough issue in the future of solar using.

### 2-2 Solar photovoltaic system

For the solar system, there are two styles of using solar cells to produce electricity:

independent type and parallel type. Because the policy of government of electricity price, most of solar user in Taiwan choose parallel style in use solar cells. It is not the regular power saving method.

For the far-off area, the length of transmission line is rather long, it is known that the voltage drop will be happened, the power loss will be added, and the materials of line will be increased. It is not to mention the maintain fee. The economic efficacy should be considered for those small capacity uses, the needs of equipments should be more to stabilize the output so that the parallel could be made. In addition to the condition of parallel and cost, there is a problem that occurred during parallel style was used.

**2-3 Power inverter**

In this structure an inverter should be use to convert DC to AC with conditional required. An inverter is made by semiconductor switching elements such as SCR, GTO, GTR, IGBT, or power MOS, Fourier series indicates that with the properties of switch the output could be recognized as a sine wave sets. A basic inverter is shown in figure 1. While the inverter is used, no matter how many steps of converting, a set of harmonic waves will be occurred. The relationship between the output of inverter and sinusoidal is illustrated in Figure 2. It can be found early that the output of the inverter is different from a pure sinusoidal wave which is used in the power system.

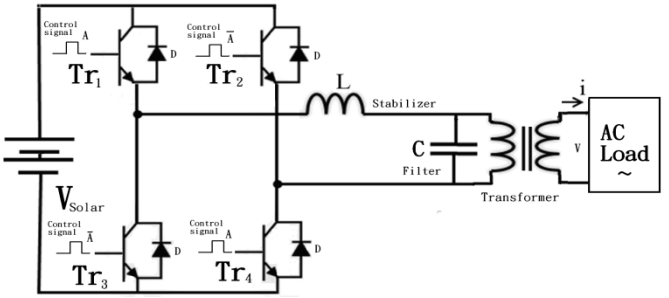


Figure 1. Principle of a basic inverter

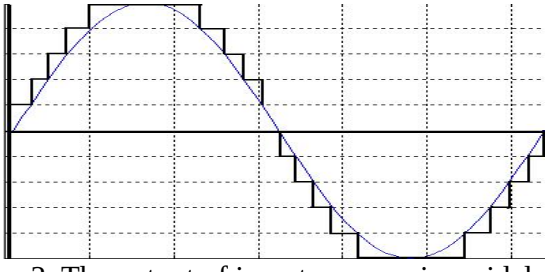

Figure 2. The output of inverter v.s. a sinusoidal wave

### 2-4 System composed and control unit

There are some devices are used to construct the system, such as solar cells, batteries, protectors, pumper, electrical motor, fans, sensors, and control units. Sensors are used to sensing variables; Solar cells provide energy. Batteries store energy; pumper and motor execute actions. And control unit is the heart (mind) to decide the strategies. Either single chip microprocessor or arduino is suitable for using. In the system a single chip microprocessor 8951 is chosen. An 8951 is used for the low price, low energy consumption and low level required control as a control unit. An 8951 was used by programmed a designed program, the control strategy flow chart is shown in the followed figure, section 3, below.

### 2-5 Water Cooling

In this system water is involved to be a medium, for the characteristic of Specific Heat Capacity of water. It is known that each Celsius degree of rising water needs 1cal/g, the value is larger than many kinds of material therefore it was used to absorb the heat. The water needs 4200 joules of heat then one liter of water need 1000 cal to rise one Celsius degree. The formula could be represented as $Q = cm\Delta t$ (Q: heat, c: specific heat capacity, m: mass in Kg, $\triangle$t: temperature-changed) .

Table 1. The heat requirement for 1gram while rising 1 $^0$C
(Some materials often used in house)
Water: $4.2\times10^3$ J / (kg°C)

| Material | Heat requirement (cal) |
|---|---|
| water | 1.0 |
| Aluminum | 0.22 |
| Iron | 0.11 |
| Copper | 0.09 |
| Silver | 0.06 |
| Lead | 0.03 |
| Concrete | 0.88 |
| Glass | 0.84 |
| Granite | 0.79 |

Meanwhile, the required power should be considered. A solar cell could provide 250 Watt, in general, therefore a 4-parallel solar cell could offer about 1kW of power. With the formula, $U = mgh$ , the potential required for one liter water to rise one level (say, 2.5 m) needs about

600 W. The work could be done by solar sets by parallel. As for those building higher than two levels, a hierarchical structure would be used to overcome the problem.

# 3. Methods

### 3-1 System structure

The using of Air conditioner in summer will occupy huge percentage depletion of energy. To lower the usage of air conditioner means to decrease the usage of electricity power. So the recycle water is introduced. There are two main meaning to use recycle water, first, the enthalpy of water make it can absorb heat from around to low the temperature so that the usage of air conditioner could be cut down, it means power saving.

Meanwhile, the recycle water comes from low pollution used water after through a filter, and it can be supplemented at any time to keep a proper level to be used. The control unit is composed by single chip micro processor, sensors, pumper, tank, DC motor, battery, and electrical fan. Some protect circuit would be included of course. The reason that use of electrical fan is the fan use much lower power than air conditioner.

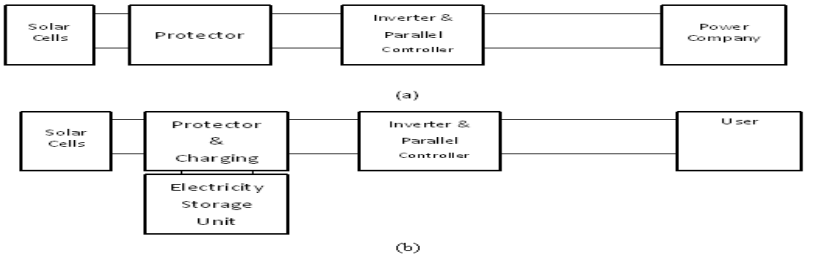


Figure 3. The general styles which solar photovoltaic system used, (a) Parallel style; (b) Independent style

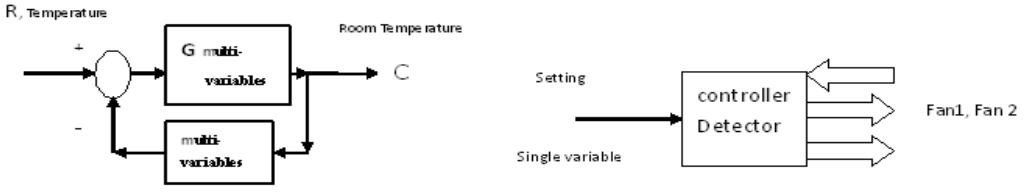


Figure 4. Control system description

Once the system start on the system will be in stand by condition, and form a closed system. The commands have set already by previously program in microprocessor; the response of the system is the temperature of indoor. Sensors are used to sensing desired variables.

### 3-2 Control strategy

The control strategy flow chart of the system could be illustrated in the following figure. For a generate living house the control algorithm can be chosen easy, a common use of on-off, proportional, is enough. A brief description is shown below. Stage one, fan would be open; stage two, sprinkle water pumper would be on; stage three, start two fans; while stage four, all devices would be started at the same time. Meanwhile, at any period, water level is overseen. All these actions are controlled by 8951.

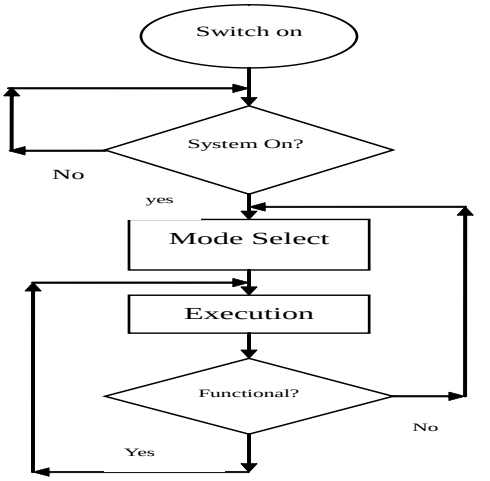


Figure 5. Flow chart of control strategy

### 3-3 Water system

A cooling water system has considered inside the energy saving system, for the water will be become, and always be, a resource in the earth. The low pollution water, such like hand wash water, would be used after precipitation and percolation. The water will be store in a tank to be used. In order to decrease the power required at the same period, the hierarchical structure was used, that is, only small power motor would be required so that only small capacities energy could be used to handle overall system. The idea of pump water was illustrated in Figure 7.

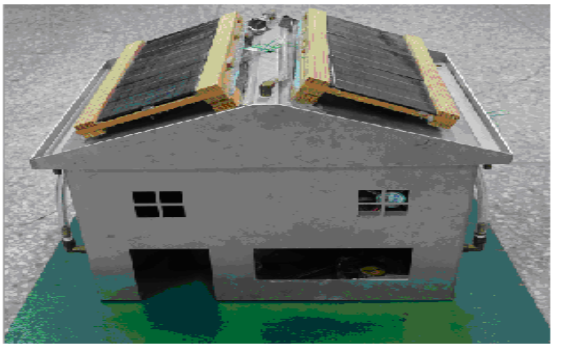

Figure 6. A simulated model of the system

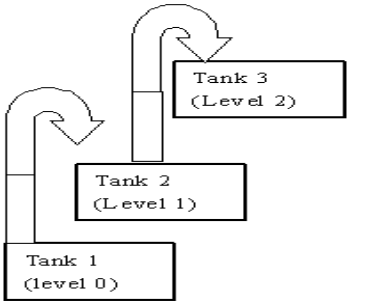


Figure 7. The hierarchical pump water system

## 4. Results and Discussions

A simple model of house was built to simulate the system, the solar cells was installed amount the roof to provide energy. Also, battery, pumper, motor, water tank and control board with micro processor were in side to form the system described ahead. An experiment was done to demonstrate that system is worked while put the simulated model under the sun shine. Also, the water system was included to accomplish the simple system of energy saving. Here a multi-faceted considerations and distributed power system concept were provided also.

The question that should be considered is that while enlarging to real building whether the power is enough to supply the devices. Therefore, the main and minor using concepts are appeared. The second question is that whether the response is fast enough to reduce the temperature while cooling by water. It will like to say that the cooling feeling is up to each individual, there is no standard to follow. And the third question is how about winter while temperature is low. In low temperature period, the need of auxiliary lighting will be increased, so the produced power can be used to make up the needs.

In fact, there are more than the above questions, after all this is a single step to saving energy with small capacity of solar energy. A DC subsystem should be built to reduce the rely on main power system. The so call subsystem, minor, is that it will not influence the normal using of power system but could help the main system to decrease the loading. It is believed that with the mind, the target system would be better and to achieve the benefit of energy saving.

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# Preliminary Assessment of the Changes of Individual Electroencephalogram and Salivary Alpha-Amylase Activity after Inhalation of Agarwood

K.S. Yao[1*], S.H. Wu[2], Y. Wang[3]

## Abstract

Agarwood plant (*Aquilaria* sp.) is native to China and South East Asia countries. Since ancient times, it had been widely utilized as medication for improving patient various symptoms such as empty colic, pyrogenous dysentery, emotional stagnation, paralysis, and diarrhea. Plant essential oils, termed as aromatherapy, have attracted much more attention in recent years. Many reports show the effects of essential oils on the physiological and psychological activities of human, but the efficiency of medication varies on the difference of individual. Therefore, the focus of this study attempts to rapidly assess the changes of individual electroencephalogram (EEG) and salivary alpha-amylase activity (sAA) after inhaling agarwood essential oil (AEO). These results showed that the promotion proportions of alpha-rhythm power recorded at the left and right brains were respective 16.0 ± 1.0% and 18.7 ± 8.3%, whereas the delta-rhythm power of right brain decreased 21.2 ± 3.2%. Besides, the activity of individual sAA was also approximately diminished 11.2%. In other words, the evidence showed the relaxation of individual emotion to response with inhalation of AEO. In summary, the changes of individual EEG and sAA level appear to have potential for using as non-invading biomarkers for rapid examination the impact of inhalation of agarwood on individual physiological and psychological activities.

**Keywords:** Agarwood Essential Oil, Electroencephalogram (EEG), Salivary Alpha-Amylase Activity.

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# 1. Introduction

Agarwood plant, a family Thymelaeaceae, is native to China and South East Asia countries, including Vietnam, Cambodia, Laos, Thailand, Malaysia, Indonesia, *etc.* (1). The first record concerning the effectiveness of agarwood was discovered in the Traditional Chinese Medicine (TCM) book named as "Mingyi Bielu", which was edited by Tao Hongjing (A.D. 456-536) in the period of Northern and Southern Dynasties (A.D. 420-581) in China. Until 1694 in Qing Dynasty, "Bencao Beiyao" a pharmaceuticals book, clearly showed that the nature and flavor of agarwood is temperate, pungent and hot. The pharmacological effect of agarwood enables to deliver into the spleen organ and mainly adjust various "Qi" circulations and bring peace to the body according to the theory of TCM (3, 15, 19, 23). Briefly, it was often applied to remedy patient's diseases and symptoms including empty colic, pyrogenous dysentery, emotional stagnation, evil influence, dispelling cold, paralysis, diarrhea, *etc*. Besides, several reports further show that some compounds in agarwood can significantly inhibit the proliferation of cancer cell lines, such as human neural cancer (SF-268), breast cancer (MCF-7) and lung cancer (NCI-H460) in recent years (8).

Plant essential oils, a complex compound of secondary metabolism had been widely used as a medicinal treatment from ancient times. In recent years, it, also named as aromatherapy, has attracted much more attention. Nowadays, over 400 essential oils are available for improving physiological functions and/or specific symptoms of individual (14). Many researchers have attempted to verify the impact of odors on the physiological and psychological activities of body (9, 10, 13, 21). However, the influence of fragrance on those activities of human appears to exist in many variances, even depending on the difference of individual. Therefore, it is necessary for how to rapidly and effectively assess the impact of agarwood essential oil (AEO) on body under subjectivity condition.

Since 1924, electroencephalogram was first recorded by Hans Berger, it had been widely applied on the practical use for diagnosis in various countries such as United States, England, and France (4, 22). A new phase for exploration and understanding the activity of human brainwaves was started from that moment. Brainwaves are at least divided into four major patterns according to the frequencies, which are in the range of 0.5 to 3.5 (Delta), 3.5 to 7 (Theta), 7 to 13 (Alpha) and 13 to 30 (Beta) cycles per second (Hz). Several papers also clearly showed that α wave of an adult is in the main rhythm activity under the quiet and arousal condition. However, it rarely appears in the anxious people, replacing with more high frequency of β wave (7, 27). Nowadays, EEG is a new tool for rapid measuring neurological

system signals.

On the other hand, several reports have demonstrated that the release of salivary alpha-amylase (sAA) of human is related with autonomic nervous system (ANS) and the sympathetic nervous system (SNS) in particular. Therefore, several researchers considered that sAA is also a suitable biomarker tool for monitoring the activities of stress-induced change in ANS of body (2, 12).

Agarwood is also one of the important spices in daily lives in Taiwan. However, it is still unclear whether it affects the physiological mechanism of body after inhaling AEO. The authors have successfully obtained agarwood from the plant of *Aquilaria sp.* using an artificial infusion method in previous research (26). Therefore, the main focus of this study is to explore the changes of individual EEG and sAA activity during the period of inhalation of AEO.

# 2. Materials and Methods

## 2.1 Experiment instruments

The equipment of EEG 2000 type was purchased from Mindquest Inc., Taiwan and carried out (Fig. 1). In order to obtain the quantification data, the operation of brainwave collector was conducted under the quiet environment and indoor surrounded by interference-free of strong electromagnetic as well as setup directly at FP1, T5, T6 and Fpz points according to the user's manual modified from the international 10-20 system (11).

Fig. 1. EEG 2000 type machine, a brainwave collector purchased from Mindquest Technology Co. Ltd. in Taiwan.
(URL http: //www.mindquest. com.tw, as cited from Wu, et al., 2015 & 2018).

The activity of individual salivary amylase was determined using UV-visible spectrophotometer (V-530, JASCO). The chemicals including 3, 5-Dintrosalicyclic acid (DNS),

soluble starch, and potassium sodium tartrate were purchased from Alfa Aesar Company (USA) and Shimakyu's Pure Chemicals (Osaka, Japan), respectively.

**2.2 Procedures**

2.2.1 Inhalation of AEO and signal records of EEG

The experimental operation in inhalation of AEO and signal records of EEG were slightly modified from the methods described by Son *et al*., 2014 (17) and Wu *et al.*, 2015 (24). Briefly, the operator had to first keep the feelings of calm and relaxation during the tested period. Keeping close eyes was then initialized and carried out for 15 min under no fragrance environment before each test for comparison.

In order to fill the fragrance of the agarwood in a small hand-made chamber (Fig. 2) for smelling test of scent, the sample of 0.5 ml AEO was extracted from *Aquilaria* plant described by Yao and Chen, 2017 (26). It was heated on an electric hot plate for 10 min before performing brainwaves test. Then the subject of individual had to sit in front of hand-made chamber and keep evenly and slowly breathing via medical plastic mask for 15 min. The change signals of individual EEG were recorded under this condition and repeated for triplicate. The relative percentage of brainwave strength power was further calculated by the following formula.

Relative percentage (%) = $[(B_{15} – B_0)/ B_0]\times 100$,

Where $B_0$ = the strength power of brainwaves before inhaling essential oil (t= 0 min)

$B_{15}$ = the strength power of brainwaves after inhaling essential oil for 15 mins (t=15 mins)

At the same time, the saliva of subject was sampled with sterilized cotton and the sAA activity was further analyzed as the following steps.

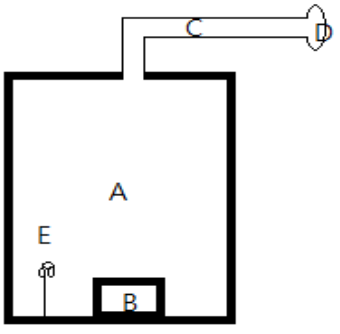


Fig. 2. A sketch of small hand-made chamber for smelling test of scent. A: closed cylindrical chamber (16 cm diameter × 27 cm height); B: electric hot plate; C: long connected tube (4cm diameter × 36 cm length) for discharging fragrance; D: medical plastic mask for breathing use; and E: small USB fan for discharging air.

2.2.2 Assay of salivary alpha-amylase (sAA) activity

The assay method of sAA activity was slightly modified from the method described by Hamilton *et al.*, 1998 (5). Briefly, the saliva sample was first kept in 10 ml of 0. 9% saline solution (containing 0.1 mM $CaCl_2$) after sampling. And the reaction was started by adding 0.1 mL of saliva sample to 0.4 mL soluble starch (1%, w/v) in 0. 9% saline solution (containing 0.1 mM $CaCl_2$) for one hour at 37 °C. The reaction was then stopped by adding 0.5 mL of DNS reagent (containing 40 mM 3, 5 - dinitrosalicylic acid, 0.4 M NaOH and 1 M K-Na tartarate). Subsequently, the samples were heated in boiling water bath for 10 min and further allowed to cool down in cold water.

For comparison, the DNS reagent was added to the enzyme-free substrate solution. After dilution with distilled water (up to 10 mL), the absorption value of optical density (590 nm) was determined by using a spectrophotometer (Model V-530, JASCO, Japan). Besides, the reducing sugar produced by enzymatic activity was determined using a standard curve obtained with glucose. Under the reaction at 37°C, one unit of enzyme activity (U) was defined as the amount of enzyme required to produce 1 μg of glucose from soluble starch per minute.

2.3 Data analysis

To assess the changes of EEG and sAA activity before and after inhaling AEO, all experimental data were recorded and further calculated with the formula described above. A paired t-test method was carried out and p value less than 0.05 meant statistical significance.

# 3. Results and Discussion

### 3.1 Signal records of EEG

Several researchers have even clearly indicated that the changes of alpha and beta brainwaves depend on the mentality of individual (6, 18). Nowadays delta rhythm still least understand and remain a pretty mysterious area for us but several researchers believe it to response with the state of unconscious mind and/or deep sleep (16). As shown in Fig. 3, the changes of alpha waves were clearly observed after inhaling AEO for 15 min. And the promotions of relative strength proportion of alpha rhythms in the left and right brain were up to 16.0 ± 1.0 % and 18.7 ± 8.3 %, whereas beta waves were slightly decreased. Besides, the delta waves obviously decreased 20.2 ± 6.9 % and 21.2 ± 3.2% ($p < 0.05$). The reduce proportion of theta waves in right brain reached 6.7 ± 0.5% ($p < 0.05$) in particular. In short, the changes of alpha and beta waves seemed to vary not only on the mental of individual but also on the physiological and environmental conditions. However, the diminishing phenomenon of

delta waves probably resulted from the difference of subject individual and/or much more relaxation after smelling the fragrance. Regardless, more evidences and full exploration are necessary for understanding it in the future.

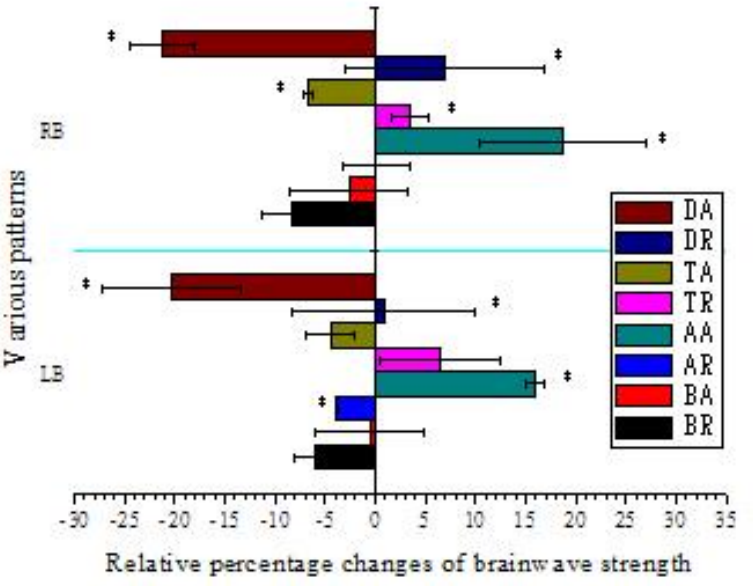


Fig. 3. The changes of relative percentage of brainwave strength before and after inhaling agarwood essential oil (AEO). LB and RB meant left and right brainwaves. BR, AR, TR, and DR represented beta-, alpha-, theta- and delta- rhythms while subject rested; whereas BA, AA, TA and DA were respective four patterns of brainwaves after inhaling AEO for 15 min. Values = mean ± S.D. (n=3, *: $p < 0.05$).

**3.2 Assay of salivary alpha-amylase activity (sAA)**

As shown in Fig. 4, it clearly showed the standard cure of glucose to obtain at spectrum 590 nm. After treated with linear regression analysis, the coefficient value of R- squared ($R^2$) was goodness-of-fit for linear model for response to the activity of sAA. The specific activity unit of sAA prior to inhalation of AEO was significantly higher than that of it after inhaling (Fig. 5). The reduction proportion of sAA activity was approximately up to 11.2% after inhalation agarwood. It implied that the emotion of individual would get suitable relaxation after smelling the scent. Recently, several researchers have also considered that the changes of sAA activity depend on the psychological stressors such as indoor environment, gender and age (12, 17, 20). Therefore, the evidence in this study is similar to those reports described above.

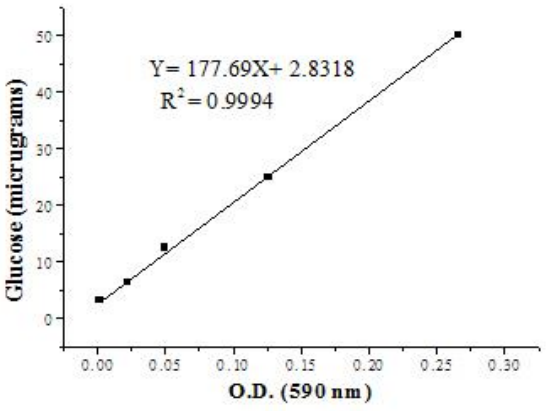


Fig. 4. A standard curve of glucose recorded at spectrum 590nm.

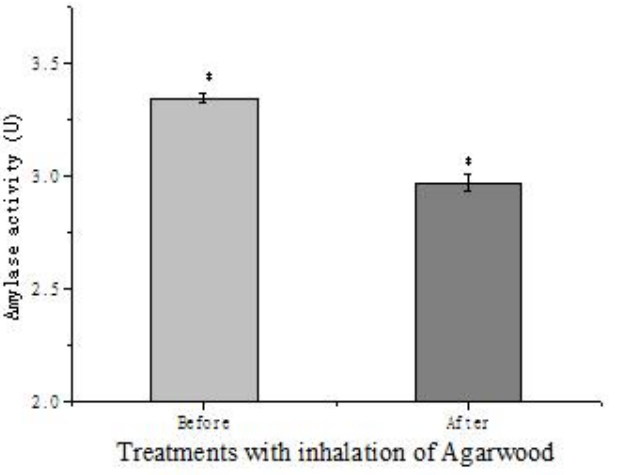


Fig. 5. The changes of salivary alpha-amylase activity (sAA) after inhaling agarwood essential oil (AEO) for 15 min. Values=mean ± S.D. (n=3, *: $p < 0.05$).

# 4. Conclusion

To sum up, the evidence of this study showed the changes of physiological indices such as alpha rhythm power of EEG and sAA activity level to cause from the factors of subject individual indeed. Therefore, they seem to have potential for using as non-invading biomarkers for quickly assessing the effects of agarwood-sniffed on individual physiological and psychological activities.

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# Novel Application of Photoresistors on the Measurement of Solar Irradiance

Yu-Chih Chieh*, Rui-Hong Chen

## Abstract

Photoresistors, also known as light dependent resistor (LDR), its resistance would vary with the light intensity. The most common photoresistor is made of Cadmium Sulfide (CdS), its light absorption spectrum is similar to that of solar spectrum. In this study, an Arduino MCU, RTC time module and 433MHz RoLa wireless module were employed to record the data. Three photoresistors with different diameter and several standard resistors with different resistances were employed to investigate the resistance changes of photoresistors under various solar irradiances. The solar irradiance ($W/m^2$) values obtained from pyranometer module by RS-485 Modbus protocol and RS-485 to TTL converter were utilized as references for calibration.

The results show that photoresistors with larger diameter possess a lower resistance value under the same light intensity. The optimal resistances of the serial standard resistors for photoresistors connected should be in the range of resistances change of photoresistors which depend on the applied environment. Moreover, the optimal sensitivity and identification could be also obtained. In addition, the correlations between the analog values and solar irradiance were analyzed by using non-linear regression. The obtained correlation equation was added into the Arduino codes and repeats the experiment again. The values of the photoresistors after correlation show well consistency with those obtained from pyranometer in solar radiance ranging from 200 to 1200 $W/m^2$.

**Keywords:** Photoresistor, Pyranometer, Solar Irradiance, Arduino MCU.

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# 1. Introduction

Solar irradiance and its measurement play an essential role not only for solar farm but also for agriculture and fishery. However, the pyranometers for industrial usage exhibit expansive and poor mobility. In addition, the most common type for the pyranometers in solar farm or agricultural plantation is fixed thermopile pyranometers[1]. It is a sensor based on thermopiles designed to measure the broadband of the solar radiation flux density from a 180° field of view angle. Because the irradiance detected by thermopile pyranometers is based on the difference between the temperature of the sun exposed area and the temperature of the shadow area. Hence, the response times of the thermopile pyranometers are therefore relative slower than other types of the pyranometers.

The photoresistors so called photocell or LDR are very low cost and usually applied in light intensity detection. Photocells are basically a resistor that changes its resistive value (in ohms, Ω) depending on how much light is shining onto the squiggly face. They are very low cost, easy to get in many sizes and specifications. Cadmium Sulphide (CdS) semiconductor compound is most commonly used in the manufacture of photoresistors because its spectral response curve closely matches that of the human eye. It has a peak sensitivity wavelength (λp) of about 560 nm to 600 nm in the visible spectral range also lay in the range of the spectrum of the global AM1.5 solar irradiation [2]. Therefore, it is possible to apply the photoresistors for solar irradiance measurement by appropriate mathematical calibration. Although several papers have been explored the photocells applied in solar radiation measurements [3-6] or used to design a solar tracking system [7,8], however, most of them were focused on the mathematical algorithm but without apparently results concerning the consistency between the photoresistors and solar irradiance. As far as we know, Orsetti, et al.[9] have been developed a reliable and inexpensive solar irradiance measurement system recently. Although the devices and modules they employed were similar to this study, however, the more expensive PV cell but not the cheap photoresistor was utilized as sensor for detect the solar irradiance and the calibration detail also not be mentioned.

The simplest method of using photoresistors to detect the light intensity is connecting a standard resistor with photoresistors in series across a single DC supply voltage, the resistance changed for different levels of light can be easily detected by measure the across voltage at their junction. Moreover, due to the prosperity of the internet of things (IoT), the related components not only become a wide variety and inexpensive and easy to obtain.

Hence, the objective of this study was attempted to fabricate a module with remarkably

low price by merely using Arduino MCU and CdS photoresistors to determine the solar irradiance. Latest LoRa low power and long range wireless communication technology was employed for data transmission. The mathematical correlations between the analog values of photoresistors to the solar irradiation were determined. The changes between the resistances of LDR and a solar irradiance and the effect of the resistance of serial standard resistor were also discussed.

## 2. Material and Methods (or Experimental)

The experimental process was depicted in Fig 1. At beginning, dozens of photoresisters with various types and diameter were selected to inspect the change of resistance of the photoresistors with solar irradiance. The examination was carried out at outdoor without any shadow on sunny day. Each of the photoresistor was maintained horizontal angle to 0.5 degree. The values of solar irradiance (W/m2) were obtained from commercial pyranometer (LP-03, JD Auspice Co.,Ltd) as reference. The resistance changes of photoresistors under different solar irradiance were measured by precision volt-ohm-milliammeter. After that, six selected photoresistors form those photosensistors with different diameters of 5.5 mm, 7 mm and 11 mm were utilized follow-up experiments. A module consists of Arduino MCU, photoresistors、RTC clock and SX1278 433 MHz LoRa device were conducted the experiment. The photorsistors were serial connected to various precision standard resistors (1%) with different resistances. The circuit schematic diagram was shown in Fig. 2. The end of photoresistors and the standard resistors were connected to +5V and GND ports respectively, and the junction of photoresistors and standard resistors was contacted to analog input A0 in Arduino MCU board. The resistance of photoresisors change with the solar irradiance was simply detecting the across voltage changes between the junction (A0) and the +5V reference voltage and then transform to a integer value between 0-1024 (10 bits) by Arduino MCU. The RTC clock time, analog values of photoresistors and solar irradiance got from pyranometer were synchronous sending by wireless LoRa device, and another LoRa device was placed about 500 m distance and connected a computer to receive and record data, as seen in Fig 3.

Subsequently, the module was placed at plaza and the surface of photoresistors adjusted parallel the pyranometer to ensure the sun light incident angle was same. The values of the analog port which the junction of photoresistors and precision resistors was connected at different time were recorded and then compare to solar irradiance values of reference pyranometer. The relationship between the analog values and solar irradiance values was analyzed by non-linear regression. The obtained regression functions were substituted into the

code and the repeat the experiment.

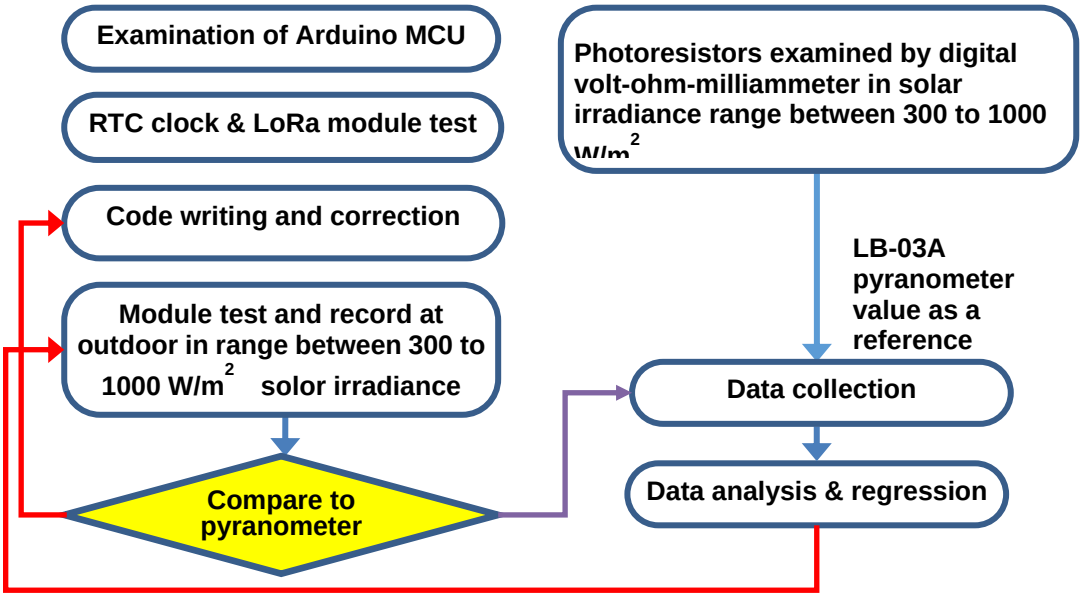



Fig 1. The experimental flowchart

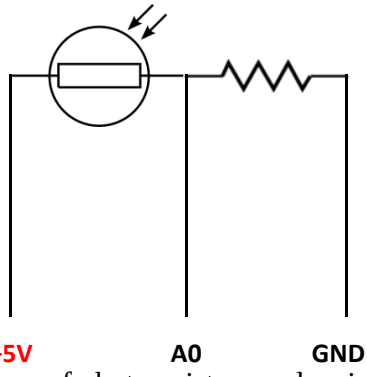



Fig 2. Circuit schematic diagram of photoresistors and serial standard resistors, A0 was the analog input in Arduino MCU.

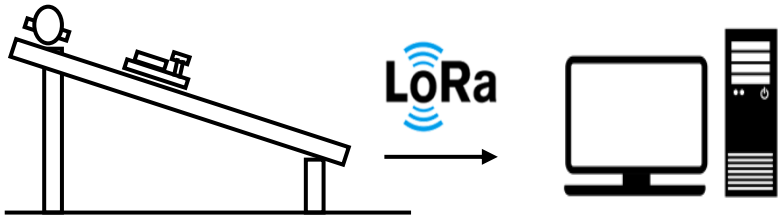



Fig 3. Schematic diagram of the module placed at same plant with the pynarometer and by using LoRa to transmit data to remote computer.

# 3. Results and Discussions

Because the resistances of most the commercial CdS photoresistors were determined at luminance ranging from dark to 100 lux in all the technical datasheet. However, there is no data has been reported referring to the changes of resistances of photoresistors under very brightly sunny day. Hence, the resistances of photorsistors were determined under normal sunny day firstly. Nevertheless, due to the materials and manufacture process, each photoresistor will act a little differently than the other, even if they are same of the types or diameters, thus the values of resistance of photoresistors alternated with the light intensity could be different. Therefore, the selecting of the photoresistors which has similar response with the sunlight plays an important work in this study.

Figure 4 depicted the resistance of selected CdS photoresistors with three different diameters of 5.5 mm, 7 mm, and 11 mm, respectively, that measured by using digital volt-ohm-milliammeter at different sunny day. As seen in figure, resistances of photoresistors exhibit non-linear decrease with the increase solar irradiance. Photorsistors with larger diameter possess lower resistance.

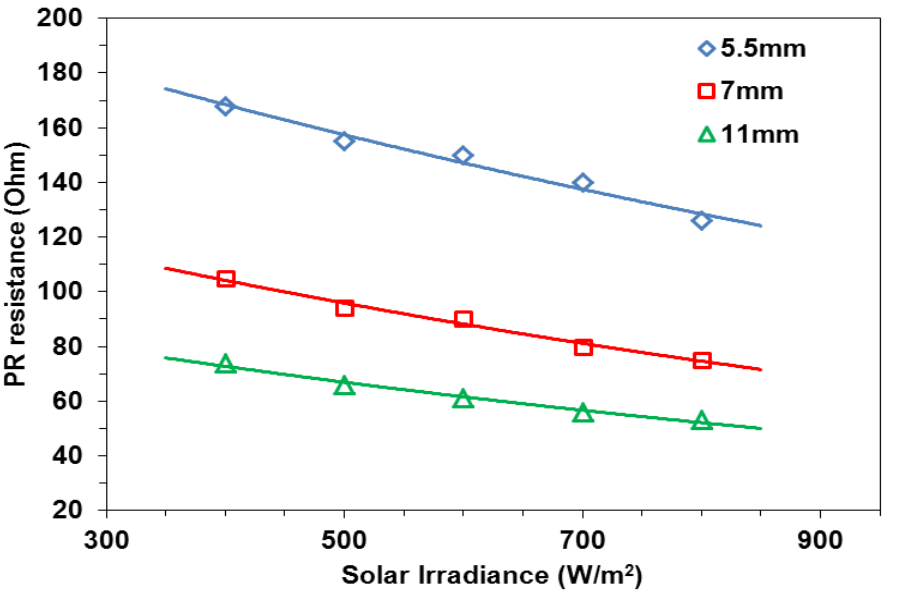
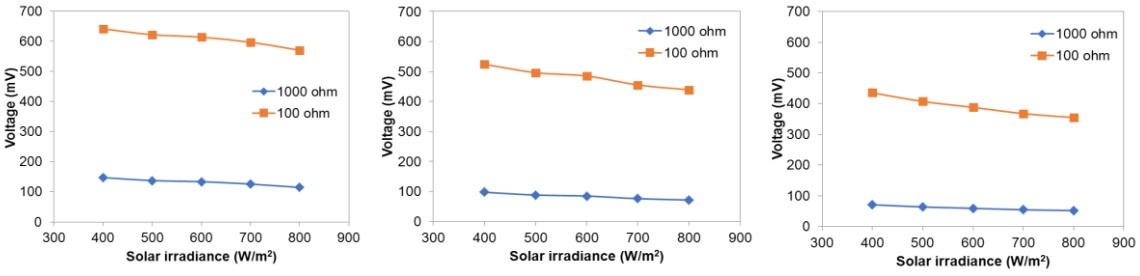



Fig 4. The resistances of CdS photoresistors with three different diameter measured from volt-ohm-milliammeter at different solar irradiation.

The across voltage between the junction and the reference supply voltage which measured from Arduino analog input would be remarkably influenced on resistances of serial standard resistors. As can be seen in Fig 5, the across voltage change with the solar irradiation of the

photoresistors with the three diameters exhibit more obviously while serial connected with 100Ω standard resistor than that of 1000Ω. It is because of the across voltage between the serial standard resistor with larger resistance is relative higher, thus the resistance of the of photoresistors change during various solar irradiance become comparably small. This means that the photoresistors would be less sensitive with the irradiance changes. Hence, the optimum resistances of serial standard resistors we selected should be in accordance with the resistance change interval of photoresistors in applied environment. That is the reason why almost all the serial connected resistors are suggested to 10 kΩ for the photoresistors applied in indoor environment luminance detection to act as light control system.

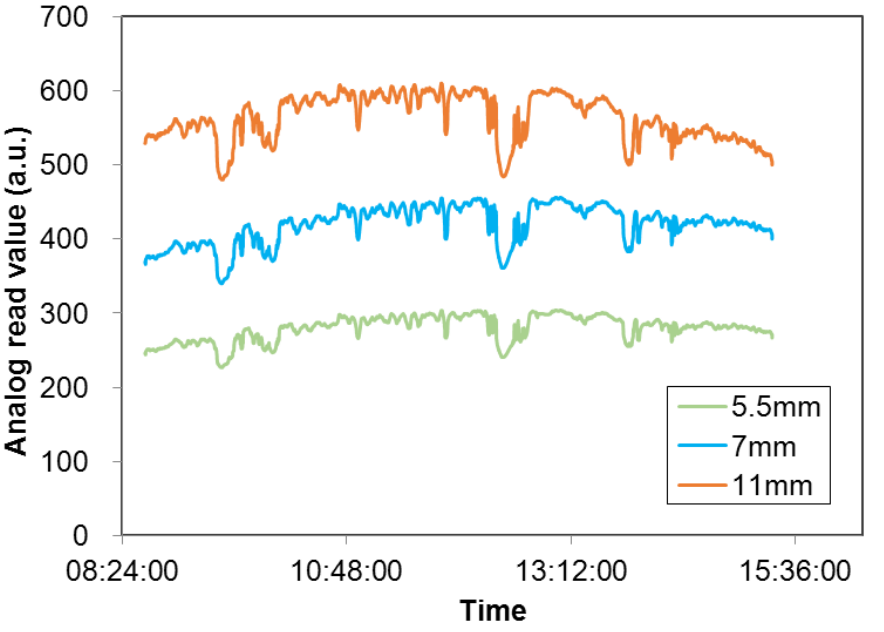



(a) (b) (c)

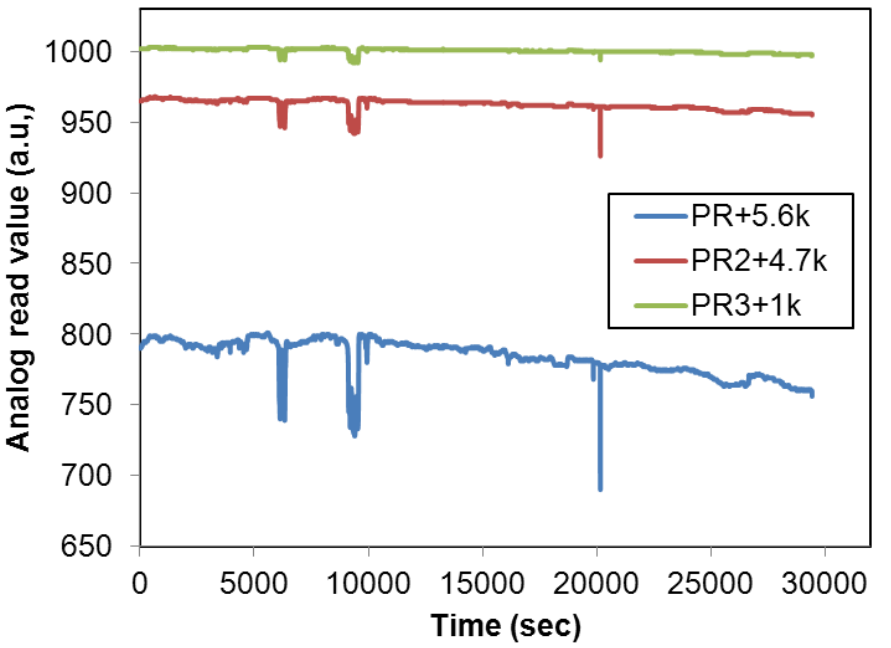
Fig 5. The across voltages at the junction of photoresistors with (a).5.5 mm (b).7 mm and (c).11 mm diameters and serial connected different standard resistors (100 and 1000 Ω)

For investigate the influences of surface area of the photoresistors to their response under same solar irradiance condition, three CdS photoresistors with different diameters of 5.5, 7 and 11 mm were serial connected the same 1kΩ standard resistors respectively then placed at same plane to record the analog values during AM 9:00 to PM 3:00. The photoresistors with larger diameter exhibit higher analog values indicate that the larger diameter photoresistors exhibit greater response and sensitivity to the solar irradiance, as seen in Fig 6.

On the other hand, the effects of serial standard resistors were further explored. Three selected photoresistors with 11 mm diameter were serial connected different standard resistors of 5.6 kΩ, 4.7 kΩ, and 1 kΩ to investigate the effects. As shown in Fig 6(a), it can be obviously find out that the variation of the analog values of photoresistors with the different solar irradiance became more apparently as the resistances of serial resistors decreased. Due to the characteristics of dark sensitive of photoresistors, the commonly used serial resistor was 10 kΩ. The results in Fig 6(b) imply that the resistances of serial stand resistors must be much lower than 10 kΩ for applying to the detection of solar irradiance.




(a)




(b)

Fig 6. The effects of the (a) diameters and (b) serial stand resistors to the response of photoresistors under sunlight.

According to the results in Fig 6(b), further inspection was conducted by using the 11 mm

photoresistor connected to various serial standard resistors. Fig 7 reveals the analog read values of photoresistor change with the solar irradiation for different serial standard resistors. The analog values change with solar irradiance became remarkably as the resistance of serial resistor decreased. The changes reveal most notably while serial standard resistor was 51Ω. It is noteworthy that not the smaller the series resistance, the more obvious the analog values changes could be obtained. Compare to the results shown in Fig 7, the optimum resistance of series standard resistors should be lying in the range of the resistance change for the photoresistors at the applied environment; also depend on the natural characteristic of certain photoresistors.

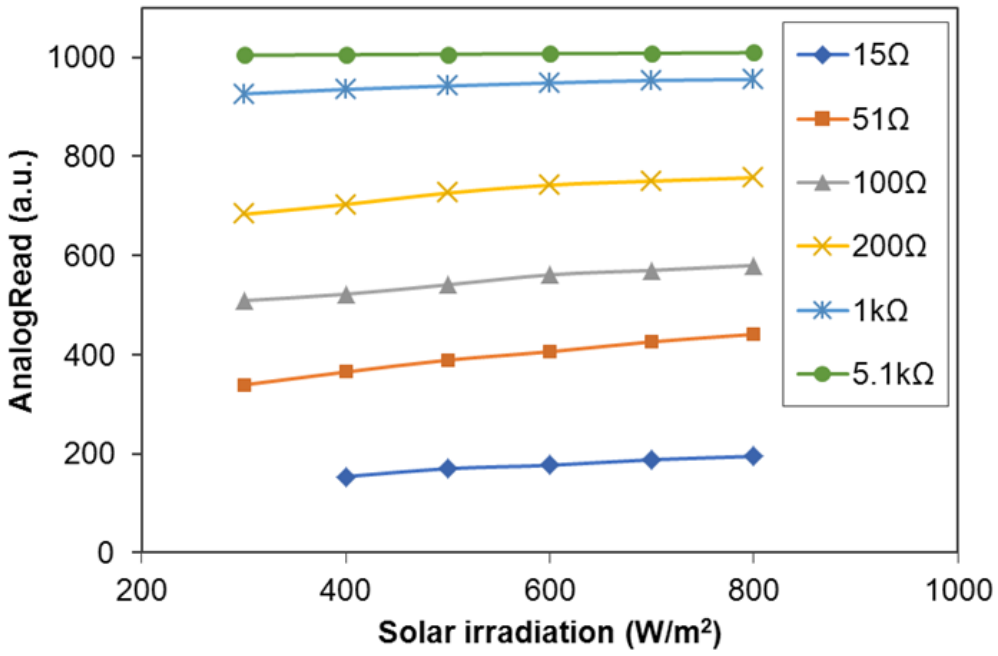



Fig 7. The analog read values of photoresistor change with the solar irradiation for different serial standard resistors.

After that, the optimal combination of photoresistor and serial standard resistor were employed to investigate the relationship between the analog value and solar irradiance. The solar irradiance was recorded from RS-485 signal of irradiance digital meter which connected to the pyranometer at solar farm. The recorded results in Fig 8 can be obviously seen that the trend of the changes of analog values of photoresistor were similar to those of solar irradiance received from pyranometer.

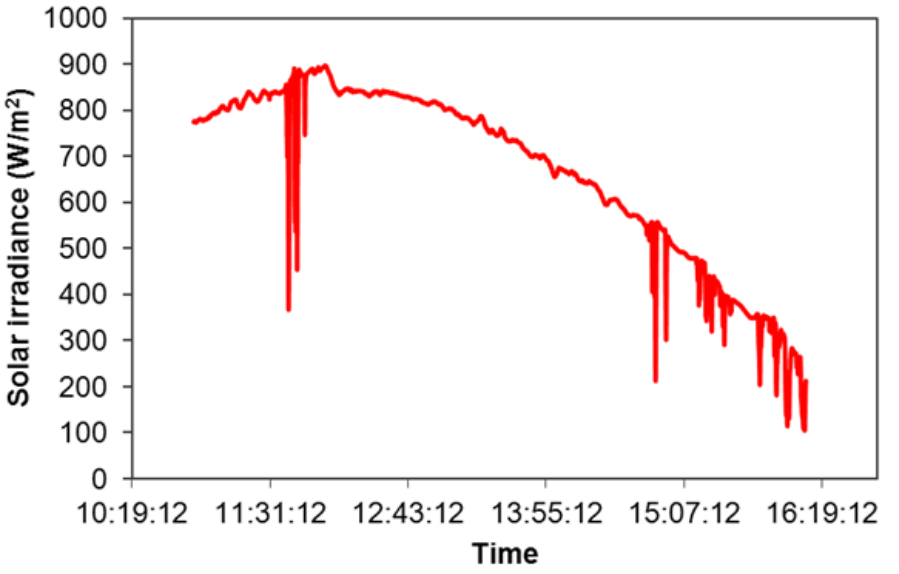



Fig 8. The recorded results of (a).analog values of photoresistor and (b).solar irradiance varied with time from AM 9:00 to PM 3:00 at same day.

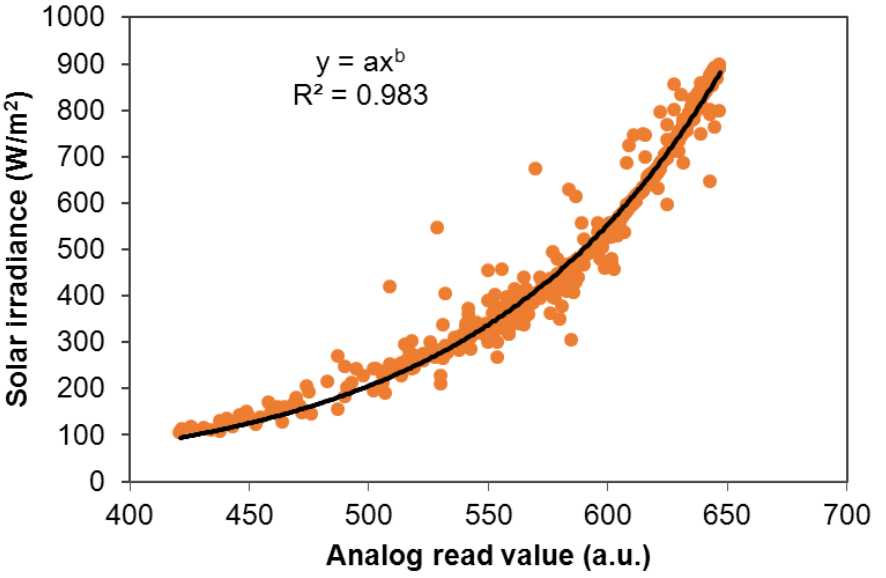
Subsequently, the correlations between solar irradiance with analog values of photoresistors were fitted by using non-linear equations of follow types

$$y = a \times x^{b} \quad (1)$$

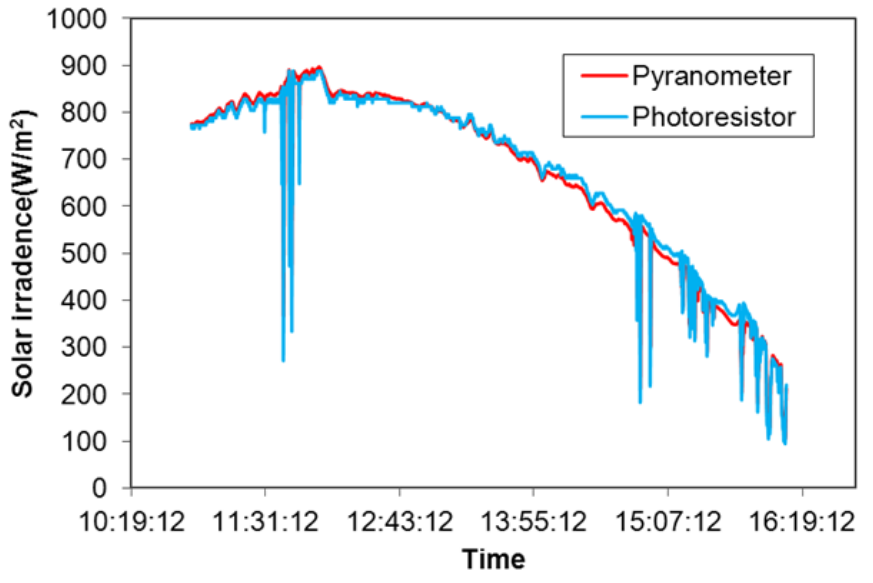
$$y = a \times \exp(x)^{b} \quad (2)$$

Substituted those analog values into the calibration equation can get new values that can be regarded as the solar irradiance. After calibration the analog values of photoresistor were shown well agreement with those values of solar irradiance which gotten from pyranometer, seen in Fig 9(a). The Arduino code was then modified according to the calibration equation.

To ensure the reproducibility and stability of measuring of the solar irradiance by using the Arduino module after calibration, we place the module in solar farm at days with different weather. Two results obtained at quite different partly cloudy days were shown in Fig 10. The values of solar irradiance obtained from photoresistors show excellent consistent with those obtained from pyranometer at both of the two days. The reproducibility and stability examination of the module after calibration were explored for up to hundred times. The results also reveal consistency between the values of photoresistor and pyranometer, thus the method we investigated for using the photoresistors to measure the solar irradiance were possess very high feasibility. It is noteworthy that the module we developed in this study has a price only 2–3% of that of industrial pyranometer.

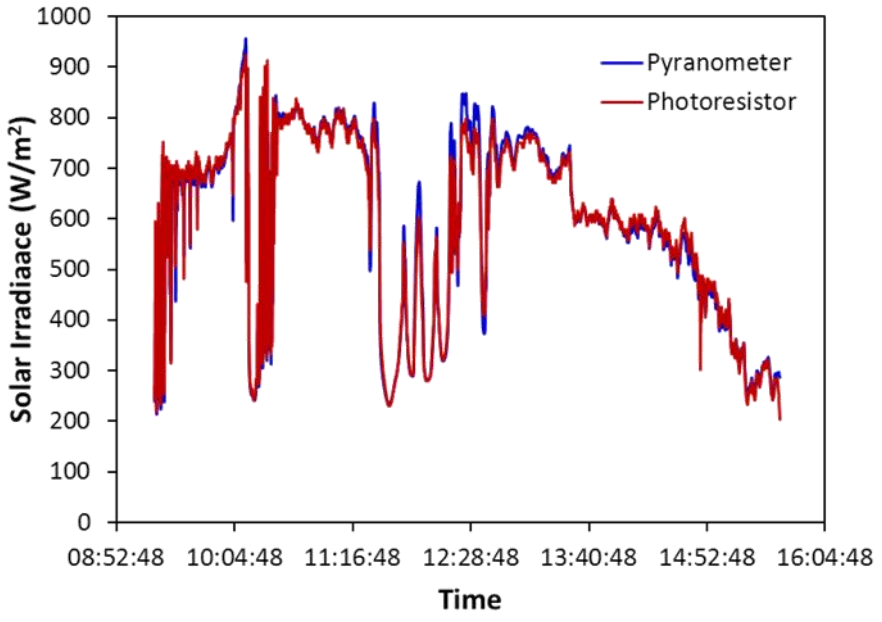



(a)

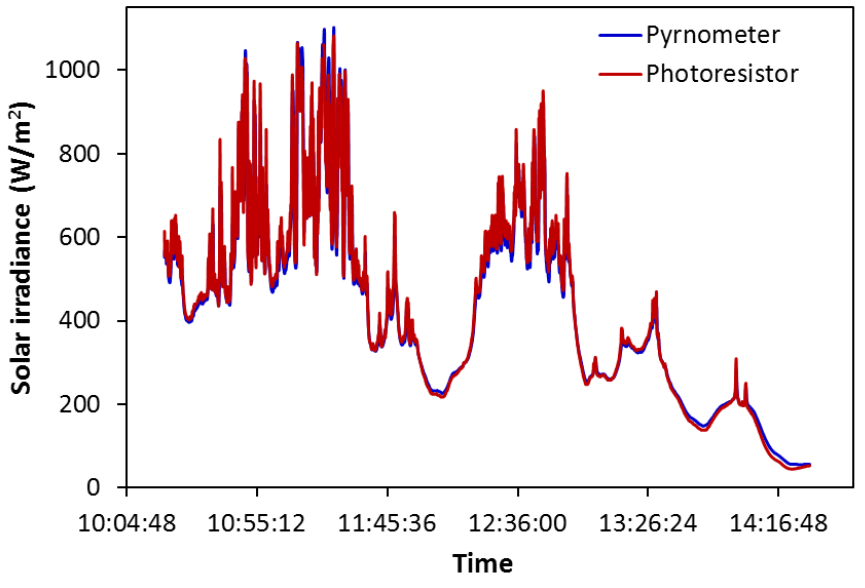



(b)

Fig 9. (a).The correlations between solar irradiance with analog values of photoresistors (b).the results of of solar irradiance obtained from pyranometer and photoresistors after calibrated by using non-linear regression.




(a)




(b)

Fig 10. The measuring results of the module placed in solar farm at different partly cloudy days after calibration.

# 4. Conclusions

1. Generally, the photoresistors is commonly used in the light control system, however, after our designed experiment; it is found that the photoresistors can also be applied to measure the solar irradiance reliably.
2. The optimal resistances of series standard resistors should be close to the range of the resistance changes for the photoresistors under the applied environment.
3. The module we made exhibits some notably advantages such as fast response, easy to carry, light weight, with flexibility and expandability. It is noteworthy that the module is very cheap, the price only 2-3% of the industrial pyranometers.

# Acknowledgments

We appreciate Department of Electrical Engineering of Hsiuping University of Science and Technology providing the skill certification and training PV solar farm to support this study.

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# The Application of Assembled Thermal Imaging Module on Solar Panel Inspecting

Neng-Fu Shih*, Chung-Jen Ou,
Yu Hsiu Chang, Chia An Shih

## Abstract

This article discusses the inexpensive thermal imaging systems, with the use of commercially available assembled thermal imaging modules, the development of inexpensive thermal imaging modules that can be mounted on drones. Compared with infrared thermometers, the thermal imaging system is tested for different distance between the lens of thermal imaging system and the solar panel, detect whether the temperature has reached the accuracy of thermal imaging system. The lens is always parallel to the solar panel. After testing, even the distance between lens and solar panel reaches 5m which is exceed the acceptable data in data sheet, the measured temperature values are within the acceptable error as compared the data in the data sheet. According to the distance between thermal image sensor and solar panel from 1m to 5m, the accuracy after testing, is found that the temperature displayed in thermal image is quite close to that display in Infrared thermometer. We adjust the solar panel from 23, 30, 45, and 60 degrees. Finally, it is successfully tested on the drone.

**Keywords:** Drones, Thermal Imaging Modules, Solar Panel, Temperature.

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# 1. Introduction

Taiwan is expected to achieve a renewable power generation rate of 20% by 2025[1]. Solar power generation is one of the blueprints for the government to plan for renewable energy [2]. It requires a large area of land to generate enough electricity to provide people with the use of the government to find enough land to build. In the solar panel field, the place where the solar panel will be built may not be limited to the general flat land. In the place where the ground subsides and is on the water, it may be the future solar power station. Those solar power station should be detected and diagnosed by applying responsible monitoring techniques.

Hot spot caused by cement deposits, bird droppings increase temperature of deposited area and produce heating [3]. Hot and humid [4], the average power degradation rate of the solar cell was about 1.36%/year, which is above the industry-accepted range of 0.7–1.0%/year [4].

In Europe, the standard test items for solar power plant acceptance and maintenance have been gradually used in UAVs equipped with thermal imaging. The causes of IR detection are mainly used to check whether there is a phenomenon caused by temperature anomaly, and the defects of solar panels are evaluated by temperature anomalies [5-7]. Common defects have hot spot conditions, which may be caused by poor quality of the module or installation and maintenance.

The purpose of this article is to produce a cheap thermal imaging system that can be mounted on a drone, and to use it on the solar panel inspection to detect whether the solar panel is abnormal or not, and attempt to use the cheap infrared thermal image module for solar panel inspection.

# 2. Methods

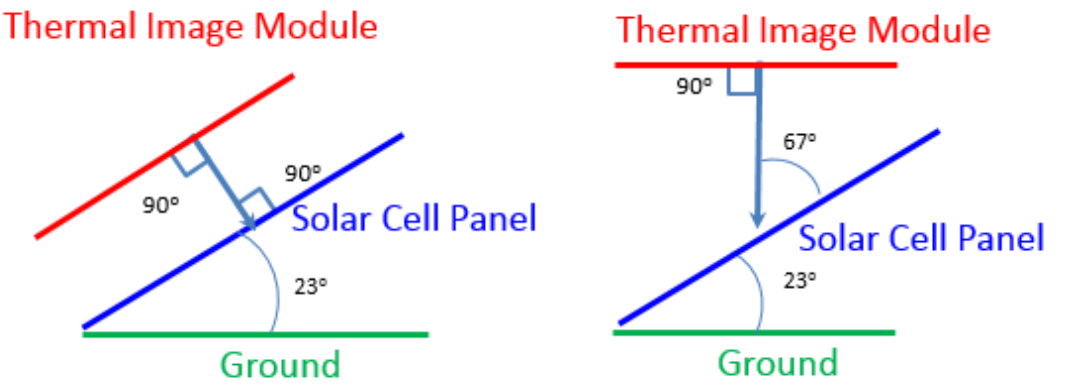
A FLIR Radiometric Lepton Dev Kit - KIT-14654 was used as the thermal image module. The camera module has a complete long-wave infrared (LWIR) uncooled VOx microbolometer, which can capture its nominal repose wavelength band from 8 to 14um. The resolution of the thermal image of 80x60 pixels. The scene dynamic range of the microbolometer is 0 to 120 oC, and the optimum operating temperature range from -10 to +65 oC [8]. The thermal image was bringing to Raspberry Pi 3B through Wi-Fi displaying onto computer or to cellular phone.

After the successful operation of the thermal image module, the temperature data have been measured. An infrared thermometer sold in the market is used as a control group for comparison. The following experiment uses solar cell panel as object under test, the official data sheet is used as a standard to check whether the accuracy of the thermal module meet the specification.

2.1 The thermal range and average temperature of solar cell panel

We adjust the angle between the solar cell panel and the ground at an angle of 23o to check the thermal range displayed on the thermal module and average temperature. Two degrees of the angle between the solar cell panel and the thermal image module are chosen to checked the thermal range on the solar cell panel. The schematic cross-sections are given in Fig.1.

First, adjust the lens of thermal image module face to the solar cell panel as shown in Fig.1 (a), and use the thermal image module to capture the image. Second, we adjust the lens of the thermal image module to be parallel to the ground as shown in Fig.1 (b), and use the thermal image module to capture the image.




(a) (b)

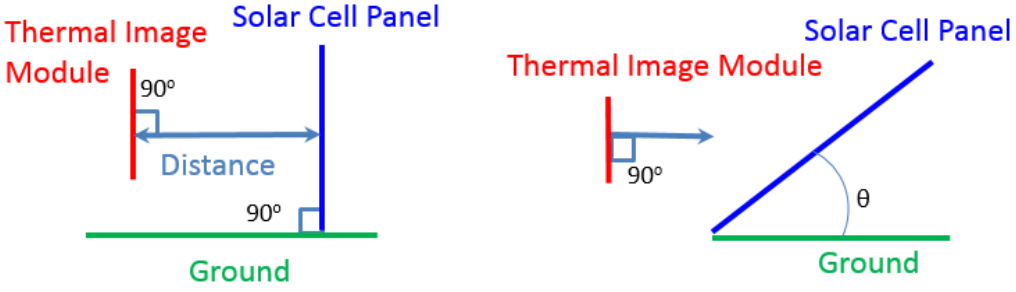
Fig. 1. The schematic cross-section set-up to check the accuracy of the thermal image module.

2.2 Infrared thermometer and thermal image module comparison test

After the test is completed, two experiments are carried out sequentially. In this section, we simulate the view angle of the camera that carried by UAV during the solar cell panel inspection. We vary the distance between solar cell panel and lens of the thermal image module from 1 to 5m fist, and then vary the angle between the solar cell panel and ground for 23 o, 30 o, 45 o and 60o. The setup of the experiments is given in Figs.2 (a) & (b). The infrared thermometer is attached upon the solar cell panel to measure the surface temperature. The data have taken 3 times whenever the distance varying distance or angle.

The first one, we measure the difference in temperature at different distance. In this experiment, the solar panel is used as the test object, and the infrared thermometer is used as

the control group. The infrared thermal image lens is fixed at the same point, and the distance between thermal image module and solar cell panel from 1 to 4 m are taken to capture the thermal image of solar cell. Second, we measure the difference in temperature at different angles. In this experiment, the solar panel is used as the test object, and the infrared thermometer is used as the control group. The infrared thermal image lens is also fixed at the same point, and the different angles of the solar panel are adjusted for temperature detection. And angles of 23, 30, 45, and 60 degrees are used.



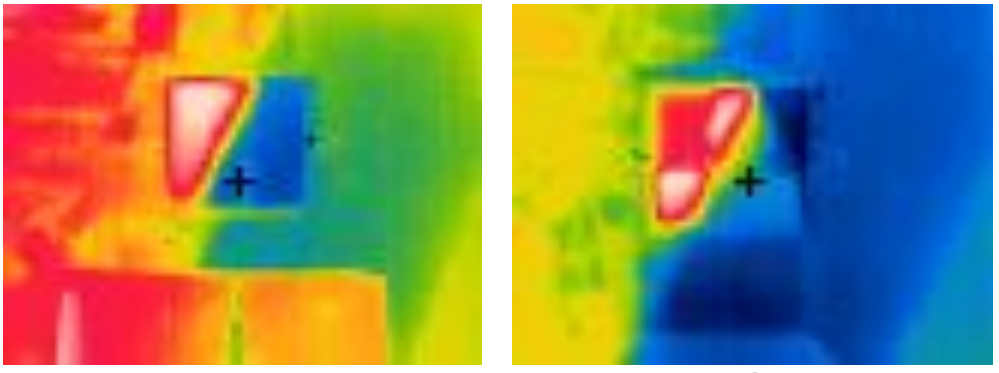

(a) (b)

Fig. 2. The schematic cross-section set-up to check the accuracy of the thermal image module.

## 3. Results and Discussions

3.1 The thermal ranges and average temperature of the solar cell panel

Fig.3 shows the thermal images with the lens of thermal image module face to the solar cell panel (indicates as 90o), and the lens of thermal image module face to ground (indicates as 67o), where the solar cell panel is placed on the center of the images.



(a) (b)

Fig.3. The thermal images with (a) the lens of thermal image module face to the solar cell panel, and (b) the lens of thermal image module face to ground.

The blue color on the solar cell panel indicates the area blocked by the shadow of the pillar, while the red even white color indicates the direct sunlight area. Table 1 gives the temperature range and average temperature of the solar cell panel. The capture temperature range and average temperature are quite close for these two angle.

Table 1 The temperature range and average temperature of the solar cell panel with two angles between the normal of the lens and the surface of the solar cell panel.

| Angle | Temperature range(K) | Average Temperature (K) |
|---|---|---|
| 90° | 295-308 | 301 |
| 67° | 295-309 | 302 |

3.2 Infrared thermometer and thermal image module comparison test

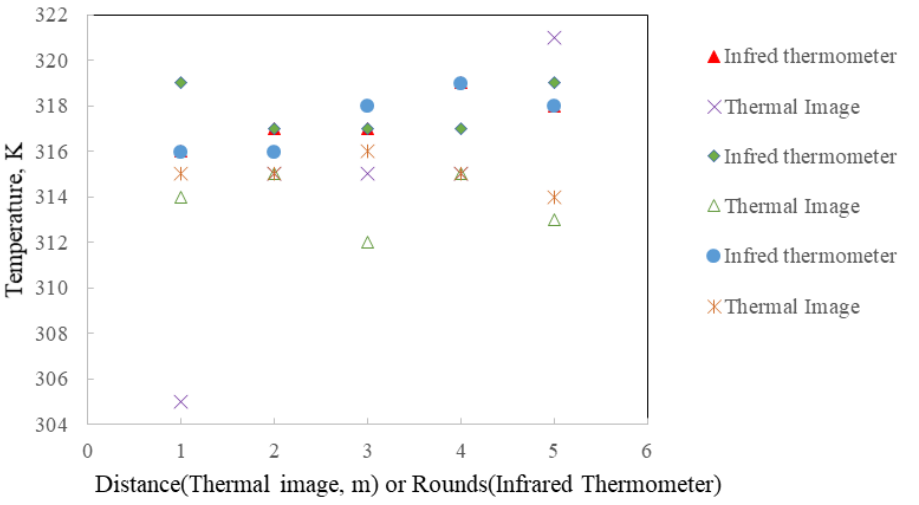



Fig.4. Captured temperature of the solar cell panel vs. the distance between solar cell panel and lens of the thermal image module from 1 to 5m

Figure 4 gives captured temperature of the solar cell panel vs. the distance between solar cell panel and lens of the thermal image module from 1 to 5m, where the open triangles, cross and times symbols indicated the data captured by thermal image module. The filled symbols data were measured by the infrared thermometer which was placed very close to and facing normal to the solar cell panel. As soon as we capture the thermal image, we measure solar cell panel by infrared thermometer at once. The data has been captured 3 times both for thermal image module and infrared thermometer at each distance. Fig. 4 reveals the temperature data capture from thermal image module are very closed to the data measured by the infrared

thermometer, except one point. The temperature captured by the thermal image module and measured by the infrared thermometer were not taken simultaneously. Actually, these data were taken sequentially. Therefore, the instant change of solar power was not taken into account. Moreover, after detail checking the datasheet of FLIR Radiometric Lepton Dev Kit - KIT-14654, we conclude the variation from thermal module may come from performing a flat-field correction (FFC) problem. FFC is a scene-based non-uniformity correction recalibrated by the camera's signal processing engine to produce the most optimal image quality [8]. It is recommended to periodically perform FFC to obtain highest quality or quickly available thermal image, and the program may perform FFC after the thermal image was captured.

Fig.5 shows the temperature variation vs. various angle of solar cell panel, where the filled triangles indicate the data taken by infrared thermometer, and the opened circles indicate the data captured by thermal image module.

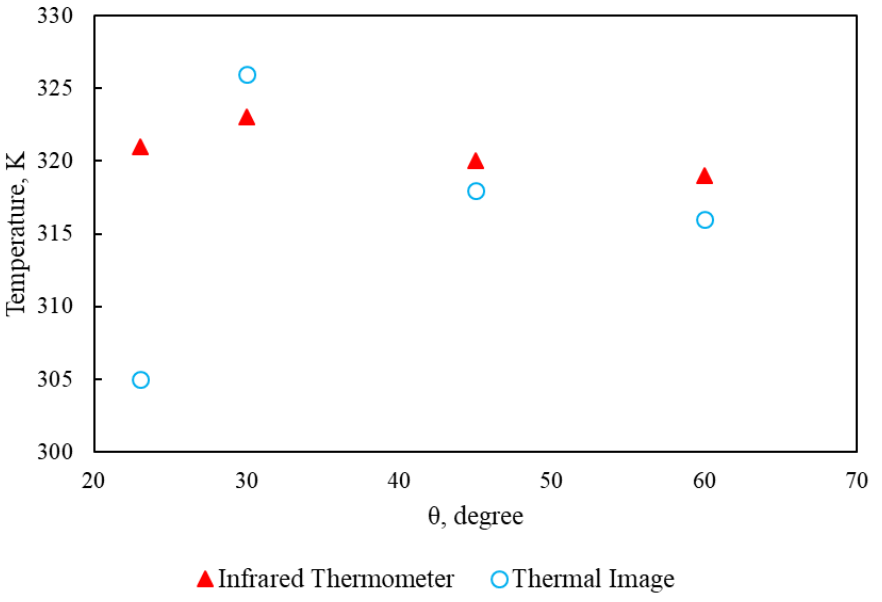



Fig. 5. The temperature variation vs. various angle of solar cell panel.

Data captured by the thermal image module and infrared thermometer are very close, except the data which the angle between solar cell panel and ground is 23o.

The temperature variation with different angle of solar cell panel may come from the instant solar power variation. The instant change of solar power should be taken into account. Moreover, the variation from thermal module may come from performing a flat-field correction (FFC) problem.

# 4. Conclusions

The thermal range displayed on the thermal module has been checked with 2 different face angle. The capture temperature range and average temperature are quite close for these two angle. The view angle of the camera that carried by UAV during the solar cell panel inspection has been simulated. We vary the distance between solar cell panel and lens of the thermal image module from 1 to 5m fist, and then vary the angle between the solar cell panel and ground for 23 o, 30 o, 45 o and 60o. The temperature data taken from thermal image module and the data measured by the infrared thermometer are approaching.

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# Application of Creative Product Design on Design Education: A Case of Board-game with the Awareness of Gender Equality

K.S. Yao[1], M.H. Lee[2], H.C. Tsai[3], S.H. Wu[4*]

## Abstract

The main purpose of this study is to design a creative product of board-game with the awareness of gender-equality using the concept of Saussure's sign for improving the basic knowledge of decrees including sexual assault, sexual harassment or sexual bullying incidents to students. Based on the semiotics, all creative cards of character in the board-game were created and related to the decrees of gender-equality education. Besides, in order to assess the educational effectiveness of board-game, a measurement tool of questionnaire with the education meaning of sexual assault, sexual harassment or sexual bullying was also developed and performed by using the method of pre-test and post-test. The results of statistical analysis using paired t test and single factor analysis of variance (ANOVA) revealed that there were significant differences in gender awareness, equality awareness, and regulatory awareness among students of different genders ($p < 0.05$). Students who attended different colleges also had differences in gender awareness and equality ($p < 0.05$). In short, the use of teaching aids of board-game with the awareness of gender, and the promotion of the relevant level of gender law should have certain efficacy and potential for wide transmission education on campus.

**Keywords:** Gender Equality Education, Board-Game, Semiotics, Paired t Test, ANOVA.

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# 1. Introduction

The law of Gender Equality Education (GEE) had been completed and issued on June 23th, 2004 in Taiwan. Subsequently, the guidelines for prevention and treatment of sexual assault and/or sexual harassment on campus had also been issued on March 30th, 2005. From that time, it implied that the procedures of handling on sexual assault or sexual harassment had entered into a new era and symbolized concretely a major advancement in GEE in Taiwan (11).

In particular, these sudden incidences including campus sexual assault and/or sexual harassment need to be clearly defined by the permanent professional office according to the procedures of standardization. However, due to many reasons such as the staff, teachers, and students' lack of familiarity with the regulations of GEE, the campus has encountered many difficulties in the implementation of practices and publicity (5, 9). Moreover, based on the statistical data of the Ministry of Education, annual average of 447 cases regarding complaints, notifications or investigations happens on the campus of university (6). In other words, there are now still more than 37 cases per month of sexual assault, sexual harassment or sexual bullying on campus. Therefore, in order to effectively reduce the occurrence of GEE incidents, it is a vital task to strengthen the general knowledge of regulations of all staff and students.

In recent years, the theory of semiotics proposed by Ferdinand de Saussure, a Swiss linguist and semiotician, has been widely applied on the field of design education. Several researchers consider that the symbol in art is a visual language used to interpret pictures (4). Therefore, the main goal of this study attempts to design a set of creative product of board-game with gender equality education using the concept of Saussure’s sign for enhancing the awareness and prevention of sexual assault, sexual harassment or sexual bullying incidents on the campus.

# 2. Methods

### 2.1 The procedures of extraction symbol image for the characters of creative products

The procedure of extraction image was slightly modified from the theory of Ferdinand de Saussure. He also considers that a sign is an entity with a meaning as well as consists of two parts including signifier and signified, as shown in Fig. 1. The meaning of signifier is a sign's physical form such as a sound, printed word, or image, whereas the implication of signified is the sense of symbol and is also a part of meaning represented the sign (1). In other words, it means understanding or idea generated by these symbols in different communicators and receivers (10).

Therefore, four major steps based on the methods described previously by Saussure (1) and Nagamachi, 1989 (7) were further proposed in this study as following. Briefly, 1): extracted the image adjectives from creative products; 2) extracted the meaning of image adjective from creative goods; 3) determined the design elements in creative goods; and 4) combined with the feeling and design elements of creative products, and further exported the criteria of design.


Fig. 1 Saussure's sign (Source: Modified from Wu and Chen, 2018)

## 2.2 Analysis of educational model based on board-game learning

In order to avoid the "traditional teaching model" and to achieve the goal of "education in-fun" (2), we first intend to use the board-game method- introduced the concept of gender equality education in this study. With the design of the board-game, students can practically participate in and further understand certain behaviors, speeches or situations, which may have violated the boundaries of sexual assault or sexual bullying on campus.

2.2.1 Pre-test and post-test questionnaire for verification analysis

(A) Questionnaire design and subjects

A measurement tool for questionnaire analysis was designed in this study, according to relevant laws such as gender equality education (3, 8). Then the subjects mainly enrolled at university were sampled for performing this project.

(B) Implement procedure

Before the implementation of the board-game with the meaning for gender equality education, the pre-test questionnaire was first conducted for 10 mins. Subsequently, students were immediately divided into different groups for playing the board-game. And they could choose the character who likes to play in the game. After ended the board-game, another 10-minute questionnaire was used as a post-test.

(C) Statistical analysis

Exception the basic information of students, a total of 36 topics existed in three dimensions including gender awareness, equality awareness, and regulatory awareness was

arranged in this questionnaire and each had five options based on five-point of Likert scale. After finished the questionnaires, the invalid data were first removed. The data were further coded and the statistical analysis methods containing paired t test and single factor analysis of variance (ANOVA) were performed.

# 3. Results and Discussion

### 3.1 The theme of board-game and symbolic meaning of character design

The theme of board-game in this project was setup the “Cupid's trap” based on the legend of Cupid's God of Love. It was said that Cupid, the son of Venus in Roman mythology is a God of love. He is often portrayed as a naughty little boy with a pair of wings on his back. His arrows including golden and lead shoot into the heart of people to produce the feelings of love romance and disgust, respectively. He often shoots indiscriminately. It makes people love and hate. Therefore, in order to remind students to carefully notice the learning for gender equality knowledge and regulations, and to avoid falling into the relevant trap of gender, the metaphor was transformed into the theme of board-game with the gender equality education (Fig. 2).


Fig. 2. The theme of board-game with gender equality education was set up the trap of Cupid.

According to the extracted procedures of Semiotics, six characters including parrot, lion, tiger, eagle, octopus and ostrich in the board-game were developed and designed. Their metaphors of signifier and signified were respectively described as shown in table 1.

Table 1. The metaphors of signifier and signified of six characters*.

| Characters and symbolic meaning |  |  |  |
|---|---|---|---|
| Signifier | Student parrot | Student lion | Student tiger |
| signified | Metaphorically introverted students | Representing students who are unwilling to compromise | Students with leadership qualities |
| Characters and symbolic meaning |  |  |  |
| Signifier | Teacher eagle | Military instructor Octopus | Nurse ostrich |
| signified | Teacher can teach the mysterious skills of the students like a magician | Means a busy image of military instructor | Metaphor nurses endure long hours of work and are good at treating any contingency |

*:The sketches of characters were drawn by Y. L. Liu for this project.

### 3.2 Questionnaire and statistical analysis

A total of 223 students containing 159 boys and 64 girls studied at university, was sampled for performing a questionnaire of this project. The percentages of boys and girls were 71.3% and 28.7%, respectively. Their distribution of major includes College of Tourism and Creativity and College of Engineering. The proportions of students sampled in different colleges were approximately 50.7%, 46.6%, and 0.9% (Fig. 3), whereas whose grade-studied in the first, second, third, and fourth year were 29.6%, 19.3%, 20.6%, and 30.5% (Fig.4).

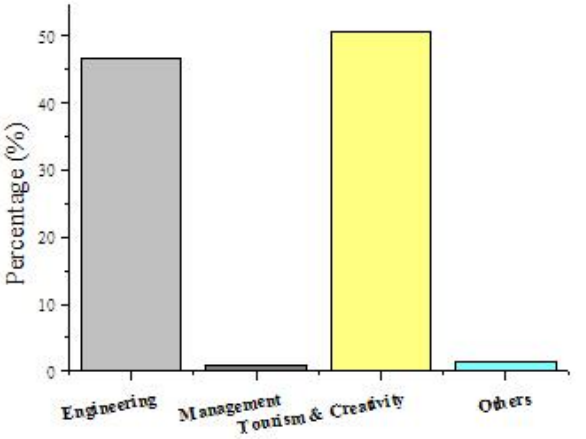


Fig. 3. The proportion of students sampled in different colleges.

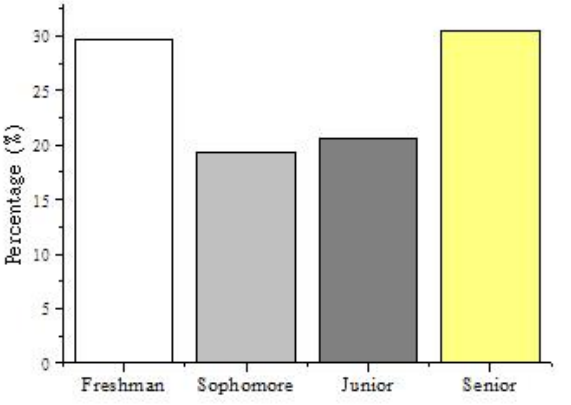


Fig. 4. The proportion of students enrolled in different grades.

The data showed that about 87.9% of the students have never studied gender-related courses before conducting this study. In addition, 73% of the students have not participated in school-level and off-campus (91.9%) gender-related education activities (Fig. 5).

After the preliminary performing, it was found that the items and texts in the questionnaire were too much and esoteric, which caused the reliability of some dimensions to be unsatisfactory. However, the reliability of the questionnaire was ideal ($\alpha > 0.7$) after recombined the items of questionnaire (Fig. 6). The Cronbach's $\alpha$ values of three dimensions including gender awareness, equality awareness and regulatory recognition were 0.74, 0.766, and 0.811.

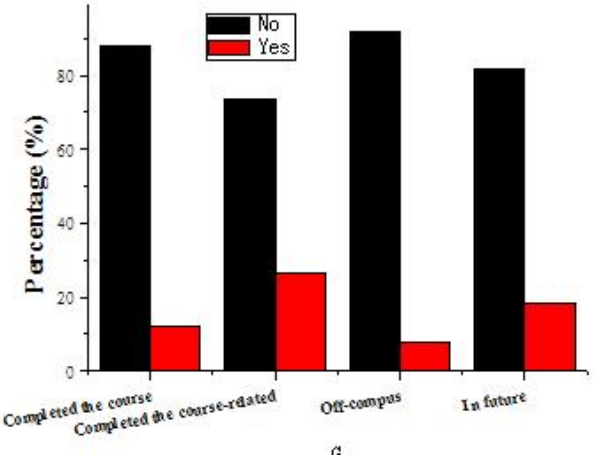


Fig. 5. The proportion of students participated in gender-related education activities.

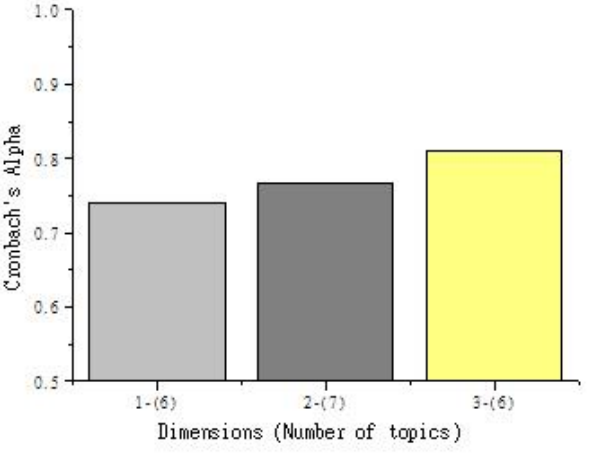


Fig. 6. The reliabilities of three dimensions in this study.

As shown in Fig. 7, we also found that the differences indeed depended on the student's gender awareness, equality awareness, and regulatory awareness ($p < 0.05$). Besides, there was a significant difference ($p<0.05$) in the awareness of gender and equality between the students enrolled in the College of Tourism and Creativity, and College of Engineering but no differences in the perception of regulations after conducting ANOVA (Fig.8). We preliminarily speculated that it may be related to the effect factors on the gender of students in different colleges, and/or the sampled number of students in the College of Management.

There were significant differences ($P < 0.05$) between the sophomores and seniors, whereas there were no significant differences between the other grades. Besides, we also found that the ratio of students who would specifically choose gender-related courses in future was

slightly increased from 12.1% to 18.4% (Fig. 5). The method of paired t-test was further used for comparing the differences of pre-test and post-test of board-game with the gender awareness, equality awareness, and regulatory cognition. The evidence showed that there were significant differences ($P < 0.05$) between before and after performing the board-game (Fig. 9). In other words, the use of the teaching-aid of the board-game should achieve a certain efficacy and to be potential for transmission the decrees about GEE.

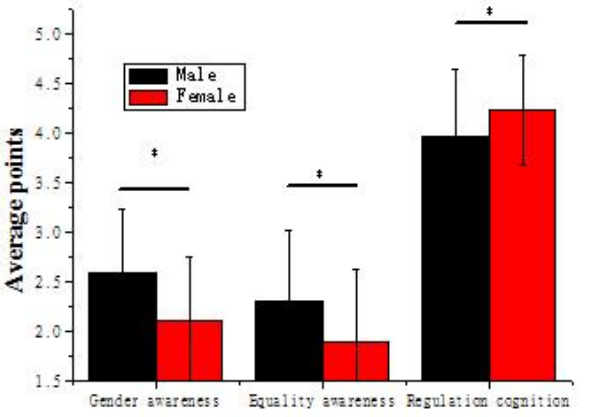


Fig. 7. The differences in gender awareness, equality awareness and legal cognition among students of different genders. Value = mean ± S.D. *: $p < 0.05$.

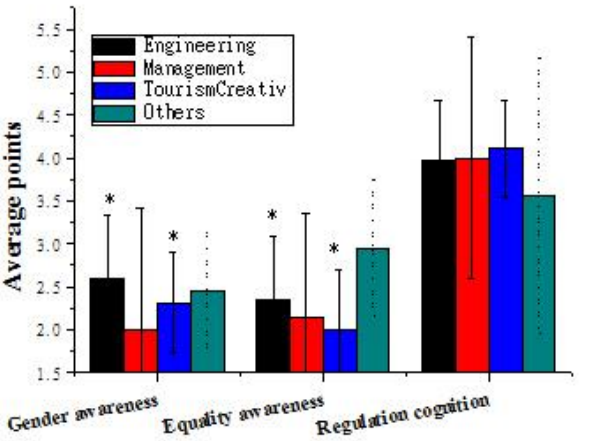


Fig. 8. The differences in gender awareness, equality awareness and regulation cognition among students of different colleges. Value = mean ± S.D. *: $p < 0.05$.

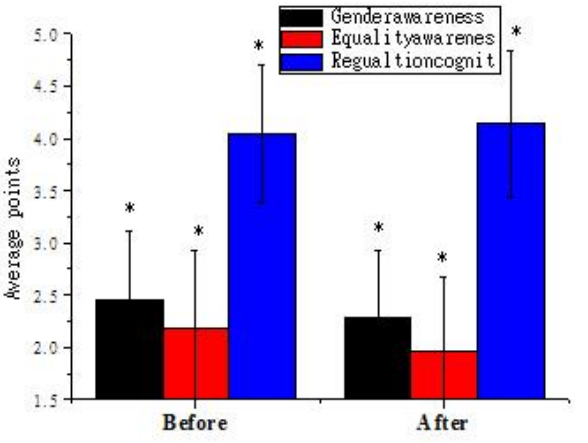


Fig. 9. Comparison of gender awareness, equality awareness and regulation cognition of students using a paired t test before and after performing board-games.
Value = mean ± S.D. *: $p < 0.05$.

## 4. Conclusion

Based on the theory of semiotics, we have completed a set of theme and six types of characters and applied at the board-game with the gender awareness, equality awareness and rule cognition in this study. Besides, we also found that the difference of issues of gender-related depended on the student's gender and studied at the different colleges. However, it showed that the students did improve the consciousness of gender equality after performing this project. In short, the application of the teaching-aid design complied with the theory of semiotics on improving the activity education should have achieved a certain goal and be potential in the future.

## Acknowledgements

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# The Application of Buddhist Humanity in General Education of University—Take Buddhist Holy Place Kushinagar in India as Example

Hsiu-O Chien, Shih-Ching Shiu*

## Abstract

Kushinagar renowned for ancient remains of Buddhist stupas and temples is situated at 53 km east from Gorakhpur, eastern Uttar Pradesh, India. It is an important Buddhist pilgrimage site, where Buddha Sakyamuni attained Parinirvana in here. The followers of Buddhism wish to visit this place at least once in their lifetime. The Parinirvana of the Buddha is described in the Mahaparinibbana Sutta, which is the principal source of reference in most standard studies of the Buddha's life. Kushinagar is one of the four ancient Buddhist holy sites. Faxian, the Chinese Buddhist monk, in the early fifth century visited Kushinagar. In the 7th century, the Chinese monks Xuanzang during the Tang Dynasty visited here too. Because Kushinagar is abundant of Buddhist thought of humanity, the authors personally visited the holy place two times to develop the exquisite teaching materials and used in the general education curriculum of the university. The students, who took the general education course of the university in central Taiwan, from three classes totally one hundred twenty-seven students, fully participated the learning. After three weeks totally six hours learning, the self-rating scale and questionnaire was used to collect the response of the students, the result showed that the learners got very good responses.

**Keywords:** Buddhist Humanity, General Education, Kushinagar.

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# 1. Introduction

Kushinagar is a pilgrimage town in the Kushinagar district of the Indian state of Uttar Pradesh located east of Gorakhpur city. Kushinagar earlier known as Kushinara was a part of the Malla kingdom, which was one of the sixteen mahajanpads (great nations) of the 6th Century B.C.E, according to the Buddhist scripture Anguttara Nikaya. The parinirvana of the Buddha at Kushinagar is described in the Mahaparinibbana Sutta. During the Buddha's last journey, he arrived at the outskirts of Kushinagar; lay down between two Sala trees to enter the parinirvana. Ashoka built a stupa and pilgrimage site to mark Buddha's parinirvana in Kushinagar. In Gupta dynasty period (4th to 7th century C.E.), the Nirvana stupa and Kushinagar site were greatly enlarged, building a temple with reclining Buddha, which reached its summit[1] [2]. Faxian, an Eminent Chinese Buddhist monk who travelled by foot from China to India between 399-412 to acquire Buddhist texts. His journey is described in his important travelogue, A Record of Buddhist Kingdoms. It states "Going on twelve Yojanas, still to the east, they came to the city of Kushinara, on the north of which, between two Sala trees, on the bank of the Nairanjana[1] river, is the place where the Lord Buddha with his head to the north, attained to parinirvana [3]."

For centuries, Kushinagar was a center of pilgrimage and there were two stupas there, one marking the place where the Buddha passed away and another marking where the cremation of his body had taken place. There were several temples and monasteries from different countries in which Buddhism is a major religion is built in Kushinagar now days.

# 2. Kushinagar and its Buddhist Humanity

The Lord Buddha preached the Dharma for 49 years in order to meet the needs of all living beings. After 49 years of missionary activities, Lord Buddha with sick body went to Kushinagar, where he ordained his last disciple, taught his last Dharma and attained parinirvana. Buddha lies on the bed between the Sala trees, comforting the disciple: The world is impermanent, and there will be departures, no worries. It was here that the Lord Buddha, the reciter of truth, breathed his last with the last words.

In the 7th century, the famous and outstanding Chinese monks Xuanzang during the Tang Dynasty visited here, the capital of this Kusiuagara country is in ruins, and its towns and

[1] The Nairanjana river, the present-day Nirajana River in the state of Bihar, especially running South to North, on the bank of which Buddhagaya is situated. It is not in Kushinagar. The correct name of the river is Hiranyavati. River.

villages waste and desolate. The brick foundation walls of the old capital are about 10 li in circuit. There are few inhabitants, and the avenues of the town are deserted and waste. ….. To the north-west of the city 3 or 4 li, crossing the Ajitavati River, on the western bank, not far, we come to a grove of Sala trees. The Mia tree is like the Huh tree, with a greenish white bark and leaves very glistening and smooth. In this wood are four trees of an unusual height, which indicate the place where Lord Buddha attained to parinirvana. There is a great brick vihar, in which is a figure of the Nirvana of Lord Buddha. He is lying with his head to the north as if asleep. By the side of this vihar is a stupa built by Asoka; although in a ruinous state, yet it is some 200 feet in height. Before it is a stone pillar to record the Nirvana of Lord Buddha; although there is an inscription on it, yet there is no date as to year or month [4].

### 2.1 To convert the last disciple

In Buddha times, kushinagar is one of the small town of Malla kingdom. When Lord Buddha chose this place as his parinirvana, Ananda, a first cousin of Lord Buddha and one of his ten principal disciples felt disappointed. Lord Buddha told Ananda three reasons for choice kushinagar [5].

1. Kushinagar is the right place to recite Mahasudassana Sutta. Once upon a time, this place was a big city of king Mahasudassana. King Mahasudassana was the preceding life of Lord Buddha.
2. Kushinagar is the right place where Subhadda will meet Lord Buddha and is the last person converted by the Buddha.

Only a few hours before his passing, as he lay surrounded by his disciples, the wandering ascetic Subhadda pushed his way through the crowd wanting to ask Buddha some questions. Ananda held him back saying; ‘Enough Subhadda, do not disturb the Tathàgata, for he is weary.’ The Buddha heard this and told Ananda to let the ascetic come to him ‘for whatever he will ask is because he is questing for enlightenment’. Subhadda took to heart what the Buddha said and later he attained enlightenment. Such was the Buddha’s compassion that he taught the Dharma almost to his last breath.

3. Kushinagar is the right place where Mahakassapa want to pack remains and relics of Buddha after Buddha get Parinirvana. Mahakassapa was one of the principal disciples of Buddha who was foremost in ascetic practice and assumed the leadership of the Sangha following the death of the Buddha, presiding over the First Buddhist Council.

### 2.2 Cakravartirajan

Cakravartirajan, the Sacred King of the Wheel, is a term used to refer to an ideal universal

monarch who rules ethically and benevolently over the entire world. It is the benevolent king in ancient Indian legends, is also an ideal political leader. Cakravartirajan appeared in the world and was extremely popular in the Sakyamuni Buddha era. In the Scriptures, the Buddha is compared with the Cakravartirajan. After the birth of the Siddhattha prince, there were immortals prophecies. If the prince were a monk would become a Buddha, and if he did not become a saint, he would be the Cakravartirajan. In Buddhism, the Cakravartirajan came to be considered the secular counterpart of a Buddha.

According to Maha Sudassana Sutta, Lord Buddha told Ananda, do not call Kushinagar a miserable little town of wattle-and-daub, right in the jungle in the back of beyond! Buddha told Ananda that once upon a time, King Mahasudassana was a wheel-turning monarch, a rightful and righteous king, who had conquered the land in four directions and ensured the security of his realm. In addition, this King Mahasudassana had this Kushinagar, under the name of Kusavati, for his capital. Besides, Buddha told Ananda that King Mahasudassana was endowed with the seven treasures and the four properties. What are the seven? The divine Wheel-Treasure, the Elephant-Treasure the Horse-Treasure the Jewel-Treasure the Woman-Treasure the Householder-Treasure the Counselor-Treasure. He was equipped with all the seven treasures and conquered the lands from sea to sea. Moreover, King Mahasudassana was endowed with the four properties. What are they? Firstly, the King was handsome, good to look at, pleasing, with a complexion like the finest lotus, surpassing other men. Secondly, he was long-lived, outliving other men. Thirdly, he was free from illness, free from sickness, with a healthy digestion, less subject to cold and heat than that of other men. Fourthly, he was beloved and popular with Brahmins and householders. Lord Buddha told Ananda that King Mahasudassana was the Buddha's past lives [6] [7].

**2.3 Modern-day pilgrimage to Kushinagar**

For Buddhists, Kushinagar is one of four pilgrimage sites designated by Lord Buddha, the other three being Sanarth, Bodh Gaya, and Lumbini. Kushinagar as a pilgrimage’s center, there were two stupa there, Parinirvana Stupa( or Parinirvana Temple) marking the place where the Buddha passed away and another Ramabhar Stupa marking where the cremation of his body had taken place. Inside the Parinirvana Temple is the reclining nirvana statue of the Buddha. The statue is 6.10 meters long and is made of monolith red - sand stone. It represents the Nirvana Buddha reclining on his right side with his face towards the west. The Nirvana Buddha statue is placed on a large brick pedestal with stone posts at the corners. In addition, Nirvana Chaitya is located just behind the Parinirvana Temple. Ramabhar Stupa about 1.5 km away

from Parinirvana Temple, this large Stupa rises to a height of 49 ft. It marks the site where the Lord Buddha was cremated. In ancient Buddhist texts, this stupa has been referred to as 'Mukut-Bandhan Vihar'.

Kushinagar has been developed as a place of pilgrimage, both for Buddhists from India and abroad. A number of countries in which Buddhism is a major religion have established temples and monasteries in Kushinagar in the style that is typical for the respective country. Thus, pilgrims and visitors have the opportunity to experience an overview of Buddhist architecture from various cultures.

# 3. Method

### 3.1 Instructional Medias

The authors have been to Kushinagar two times from 2004 to 2015. The authors made more than three hundred slides of Power Point and videos on site introduction personally. The pictures in the Power Point are explained with notes in Chinese. Some short videos were also made by the authors on site personally.

### 3.2 Experimental Processes

The students, who took the general education course of the university in central Taiwan, from three classes totally one hundred thirty-one students, fully participated the learning. After two weeks totally four hours learning, the self-rating scale and questionnaire was used to collect the response of the students.

# 4. Result

Participants were 127 undergraduate students of the university in central Taiwan who come from three different general education courses. Among them 35.4 %( n=45) was males and 64.6 %( n=82) was females.

### 4.1 Descriptive Statistics

There are twenty questions in the self-evaluating scale, the scale was scored ranging from 4(very understanding) to 1(completely does not understanding). Question1 to Question10 show in Table 4.2. Question 11 to Question 20 is compare to the former ten questions by asking "After….". In addition, there are seven questions in the questionnaire to collect the opinions of the students. Table 4.2 presents frequencies of the answer in the questionnaire.

Table 4.1 Questions in the self-evaluating scale

| No. | Question |
|---|---|
| 1 | Before learned the teaching of “Humanity thoughts of Buddhist holy place Kushinagar”, Do you understand the history that Kushinagar was the capital of Mallas, which was one of the sixteen mahajanpads of the 6th Century BCE in India? |
| 2 | Before learned the teaching of “Humanity thoughts of Buddhist holy place Kushinagar”, Do you understand the story that Lord Buddha attained Parinirvana between two Sala trees in Kushinagar? |
| 3 | Before learned the teaching of “Humanity thoughts of Buddhist holy place Kushinagar”, Do you understand the story that Lord Buddha took three month by walk from Vishali to Kushinagar? |
| 4 | Before learned the teaching of “Humanity thoughts of Buddhist holy place Kushinagar”, Do you understand the story that Lord Buddha pass life had been the Cakravartin six times in Kushinagar? |
| 5 | Before learned the teaching of “Humanity thoughts of Buddhist holy place Kushinagar”, Do you understand the story that inside the Parinirvana Stupa of Kushinagar one reclining Buddha statue was established? |
| 6 | Before learned the teaching of “Humanity thoughts of Buddhist holy place Kushinagar”, Do you understand the story that Lord Buddha ordained the last disciple, Subhadda, one hundred and twenty years old in Kushinagar? |
| 7 | Before learned the teaching of “Humanity thoughts of Buddhist holy place Kushinagar”, Do you understand the story that Lord Buddha declared that his funeral should like as Cakravartin? |
| 8 | Before learned the teaching of “Humanity thoughts of Buddhist holy place Kushinagar”,Do you understand the story that relics of Lord Buddha was divided eight portions by Drona Brahmin and was given to the eight kings who argued each other. |
| 9 | Before learned the teaching of “Humanity thoughts of Buddhist holy place Kushinagar”, Do you understand the story that Lord Buddha entered parinirvana with the posture of head north feet south and facing west, it symbolized that Buddha teaching will keep long time in the north region of India? |
| 10 | Before learned the teaching of “Humanity thoughts of Buddhist holy place Kushinagar”, Do you understand that the Buddhist from all over the world come Kushinagar on pilgrimage? |

Table 4.2 the items of questionnaire and the answer data

| item | Question | very agree | agree | a little agree | disagree |
|---|---|---|---|---|---|
| 1 | Through the pictures and films, which the teacher personally visited Kushinagar to introduce in the class, let me have the specific understanding to the geographical features and appearance of Kushinagar. | N=44 (34.6%) | N=77 (60.6%) | N=6 (4.7%) | N=0 (0%) |
| 2 | Through the pictures and films, which the teacher personally visited Kushinagar to introduce in the class, let me be very impressed by the humanity thoughts of Kushinagar. | N=57 (44.9%) | N=68 (53.5%) | N=2 (1.6%) | N=0 (0%) |
| 3 | Through the pictures and films, which the teacher personally visited Kushinagar to introduce in the class, can improve my learning interest. | N=67 (52.8%) | N=58 (45.7%) | N=2 (1.6%) | N=0 (0%) |
| 4 | Through the pictures and films, which the teacher personally visited Kushinagar to introduce in the class, can improve my motivation to visit the world religion holy place. | N=56 (44.1%) | N=58 (45.7%) | N=10 (7.9%) | N=3 (2.4%) |
| 5 | Through the pictures and films, which the teacher personally visited Kushinagar to introduce in the class, can open my vision and improve my worldview. | N=57 (44.9%) | N=68 (53.5%) | N=2 (1.6%) | N=0 (0%) |
| 6 | Through learning " Humanity thoughts of Buddhist holy place Kushinagar", let me feel like the multi-culture learning. | Yes (N=127,100%) | | No. (N=0, 0%) | |
| 7 | Through learning "Humanity thoughts of Buddhist holy place Kushinagar", I feel one should respect each religion no matter one has religion or no. | Yes (N=127,100%) | | No. (N=0, 0%) | |

**4.2 Paired Samples Statistics and Test**

There were ten pairs in the self-evaluating scale, from Question 1 to Question 20. The method of pair samples t-test was used to confirm the significance of statistic. The results as showed in table 4-3.

Table 4-3 Paired samples test

| | Questions No. | Mean | S. D. | Pair Mean | Pair S.D. | T value |
|---|---|---|---|---|---|---|
| Pair 1 | Q1 | 1.31 | .499 | -1.945 | .705 | -31.09*** |
| | Q11 | 3.26 | .491 | | | |
| Pair 2 | Q2 | 1.30 | .493 | -2.031 | .712 | -32.15*** |
| | Q12 | 3.33 | .520 | | | |
| Pair 3 | Q3 | 1.30 | .493 | -2.039 | .717 | -32.05*** |
| | Q13 | 3.34 | .523 | | | |
| Pair 4 | Q4 | 1.30 | .539 | -2.102 | .700 | -33.87*** |
| | Q14 | 3.40 | .538 | | | |
| Pair 5 | Q5 | 1.28 | .483 | -2.031 | .642 | -35.68*** |
| | Q15 | 3.31 | .463 | | | |
| Pair 6 | Q6 | 1.22 | .453 | -2.102 | .602 | -39.35*** |
| | Q16 | 3.32 | .469 | | | |
| Pair 7 | Q7 | 1.22 | .453 | -2.102 | .653 | -36.30*** |
| | Q17 | 3.32 | .469 | | | |
| Pair 8 | Q8 | 1.31 | .573 | -2.047 | .653 | -35.34*** |
| | Q18 | 3.36 | .483 | | | |
| Pair 9 | Q9 | 1.25 | .471 | -2.118 | .662 | -36.05*** |
| | Q19 | 3.34 | .485 | | | |
| Pair 10 | Q10 | 1.30 | .539 | -2.039 | .717 | -32.05*** |
| | Q20 | 3.34 | .475 | | | |

N=127 ***P＜.001

From table 4-3, the ten pairs' test all reaches the statistical significance, shows that after learned the teaching of "Humanity thoughts of Buddhist holy place Kushinagar"; the students significant agree their understanding to the main ideas of Humanity in this holy place.

# 5. Conclusion

When Sakyamuni Buddha was eighty years old, his body was infected and he knew that he would be Nirvana within three months. Sakyamuni Buddha believes that everything he has to do is done. The Buddha's teaching is sufficient. Then he leaves Vaishali, goes to Kushinagar, and choose to enter parinvana between the two Sala trees. Ananda entreats the Buddha not to allow himself to die "in this poor little town of wattle and daub," To denounce Ananda's typification of the town, Lord Buddha tells the story of King Mahasudassana. Under the name of Kusavati, Kushinagar was the capital of the king's realm and King Mahasudassana was the previous incarnation of Sakyamuni Buddha. At that time, Subhadda heard Lord Buddha's want enter prinivana, he went to the two Sala trees, received the Buddha teachings, and became the

last disciple of Shakyamuni's living. Buddha summoned his disciples and answered the questions for the final time.

For centuries, Kushinagar was a center of pilgrimage and there were two stupas there, Parinirvana Stupa marking the place where the Buddha passed away and another Ramabhar Stupa marking where the cremation of his body had taken place. Now a number of countries in which Buddhism is a major religion have established temples and monasteries in Kushinagar in the style that is typical for the respective country.

By visiting the Buddhist Holy Place Kushinagar in person, take the historical remains pictures, record a narration and video, on the application in the teaching of general courses, can improve students' interest in learning. Students under the teacher personally guidance of Buddhist scriptures people, things, times, places, have a more profound experience and learning.

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# A Study of Visual Imagery of Aluminum Can Packaging of Alcoholic Beverages

Hsiao-Wen Kao*, Yu-Chin Hsiao**

## Abstract

There are many brands of liquor with a wide variety of packages on the market today. In recent years, packaging design for alcoholic beverages with its taste perception and colors has become more diverse than ever. Packaging design, a combination of materials, color, imagery, typography, regulatory information and design elements, helps attract consumer attentions, embellish products, and increase sales. Therefore, visual imagery of packaging design is also one of main factor to affect consumers' preferences and sense of taste. Unlike alcohol-free beverage, alcoholic beverages are imposed regulative standards and restrictions, but consumers are still easily misled by their packaging because of packing similarity to other alcohol-free beverage or flavors. The main purpose of the study is to explore the relationship between visual experience of alcoholic beverage packaging and taste, using aluminum cans of alcoholic beverage sold in hypermarket as research subjects. First, the study categorized alcoholic beverage by the method of literature review. Then, the study conducted questionnaire surveys to gather consumers experience in drinking, and whether beverage packaging lines up with its taste. The survey was conducted on 19 women and 12 men, the findings on the influence of packaging on taste are summarized as below: 1. Real object pictures and descriptive texts make visual experience more consistent with tastes. 2. Color affects consumers' perception of taste. 3. Brands of Alcoholic beverages has no obvious effect on taste.

**Keywords:** Packaging Design, Visual Image, Alcoholic Beverages.

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# 1. Introduction

## 1.1 Background

There are many brands of liquor with a wide variety of packages on the market today. In recent years, packaging design for alcoholic beverages with its taste perception and colors has become more diverse than ever. Packaging design, a combination of materials, color, imagery, typography, regulatory information and design elements, helps attract consumer attentions, embellish products, and increase sales. Designers create packaging designs according to product characteristics, functions, and prices. To explain in detail, packaging design for alcoholic products, such as beer, fruit wine, etc., are different from one to another, depending on different types of products. The design process also need to consider whether packaging design enable consumers to clearly identify the characteristics of products, and so on. Thus, visual imagery of packaging design is also one of main factor to affect consumers' preferences and sense of taste. Unlike alcohol-free beverage, alcoholic beverages are imposed regulative standards and restrictions, but consumers are still easily misled by their packaging because of packing similarity to alcohol-free beverage or their flavors.

## 1.2 The Purpose of the Research

The purpose of the study is to explore the relationship between visual experience of alcoholic beverage packaging and taste. Therefore, the purposes of this study are as follows:

1. Is consumers' sense of packaging and taste consist?
2. To understand consumers' sentiments on visual packaging of aluminum can for alcoholic beverages, which may provide reference for alcoholic beverages packaging design.

## 1.3 Limitations of the Study

The study focus on aluminum cans sold in hypermarket due to numerous alcohol products on the market. The study collected a total of 26 samples of alcoholic beverages from two categories – beer and fruit wine, according to Enforcement Rules of the Tobacco and Alcohol Administration, Article 3. As a brand may make a series of fruit wines with several flavors, the study select one flavor from each series of fruit wine as research subjects.

# 2. Literature Review

## 2.1 Alcohol Beverages packaging design

According to the Sanitation Standards for Alcohol Manufacturers, Article 3, packaging

materials including inner packaging materials and outer packaging material are regulated as below.

1. Inner packaging materials refer to containers directly contact with liquor, such as bottles, cans, altars, barrels, boxes, bags, etc., and packaging materials directly wrap or cover the liquor, such as foil, film, cork, paper, wax paper, etc.
2. Outer packaging materials refer to packaging materials do not directly contact with the liquor, including labels, cartons, and packaging materials.

2.1.1 Packaging classification

Packaging can be categorized into industrial packaging and commercial packaging according to their purposes. In terms of packaging method, industrial packaging or transport packaging refer to inner packing and outer packing. Commercial packaging refers to packaging. Nowadays, the most common classification of packaging – transport packaging and consumer packaging, are globally adopted, while the classification on packaging in Taiwan usually refer to industrial packaging and commercial packaging.

| Classification | Description |
|---|---|
| Industrial package | Also known as transport packaging for transportation of goods and warehousing, served the purpose of protection, transport capabilities. Package objects include a variety of materials, parts, semi-finished and finished products, which are not directly used by consumers. The method of packaging in tandem with the nature of the article flow environment varies. The functions of industrial packaging emphasize protection and keeping liquidity in good condition. Validation test is required to test its function. Basically, a good industrial packaging design should consider economy, standards of logistics, operations in the process of transportation, automation in production, regulations of labeling, and ease of handling waste. |
| Commercial package | Also known as consumer packaging, mainly for the purpose of selling, served functions of embellishment and protection for products. Its main functions are to facilitate selling, retailing and using, and to improve efficiency in operation.<br>There are several factors should be considered to design a good commercial packaging: 1. market surveys, 2. displays on shelves 3. packaging types and sizes, 4. market competition, 5. brand images, 6. product attractions. |

**2.2 Alcohol product definition and classification**

According to the Enforcement Rules of the Tobacco and Alcohol Administration, Article 3, the classification of alcoholic drinks is as follows:

| Classification | Description |
|---|---|
| Beer | Saccharized and fermented carbonated alcoholic beverages brewed from malt and hops as primary raw materials, with or without other grains or starch as supplementary raw materials;complementary plant ingredients may or may not be added. |
| Wine | Wines are brewed from fermented fruits as raw materials<br>1. Grape wine: Wines brewed from grapes as raw materials.<br>2. Other fruit wine: Wines brewed from fruits other than grapes, or from two or more kinds of fruits, as raw materials. |
| Beverages brewed from grains | Saccharized and fermented alcoholic beverages brewed from grains as raw materials. |
| Other brewed alcoholic beverages | Other brewed alcoholic beverages are brewed from other indigents, which do not belong to the categories mentioned above. |
| Distilled spirits | Distilled spirit drinks are made from fruit, grain, or starch (or other sugar-containing plants) through the process of saccharification or not, fermentation, and then distillation:<br>1. Brandy: Distilled spirits made from fruit through the process of fermentation, distillation and maturation in wooden barrels for at least six months, with an alcohol content not less than 36 percent.<br>2. Whisky: Distilled spirits made from grain through the process of saccharification, fermentation, distillation and maturation in wooden barrels for at least two years, with an alcohol content not less than 40 percent.<br>3. Clear spirits: Distilled spirits made from grain as raw materials through the process of saccharification, fermentation, distillation, maturation, and blending, using various yeast or enzyme and ferments.<br>4. Other distilled spirits: Distilled spirits other than four categories mentioned above. |
| Other alcoholic beverages | Other alcoholic beverages are out of categories mentioned above |

（Classification and definition of alcoholic drinks）

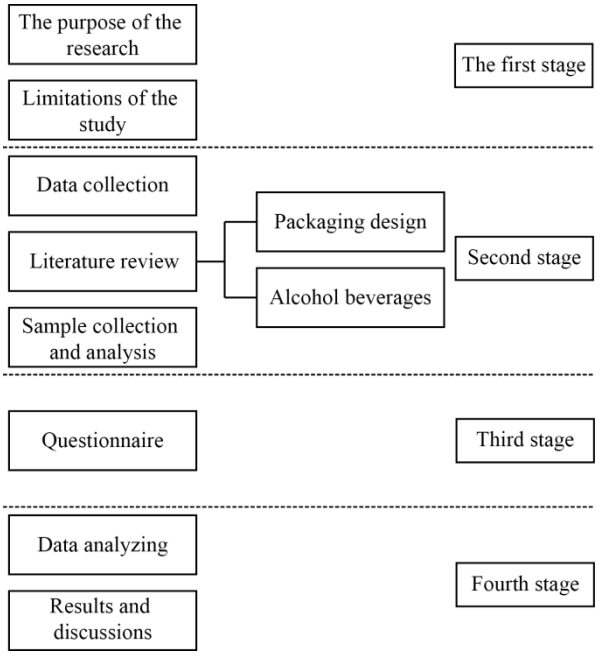
A. Color and Taste Association

People associate basic tastes (e.g., sweet, sour, bitter, and salty) with specific colors: acid associated with the color from orange to green; the sweet associated with the color from red,

orange to yellow and pink; the bitter associated with the color of black, grey, brown, dark brown and olive green with high-level to low-level brightness; hot associated with the color from purple to red, and women prefer purple red; astringent associated with the color of yellow-green, blue-green, olive green, brown with dark to light color, brown, purple and gray with high-level to low-level of brightness. The salty associated with the color of light blue, dark blue, white and grey, and men prefer white.

# 3. Research Process

The main purpose of the study is to explore the relationship between visual experience of alcoholic beverage packaging and taste, using aluminum cans of alcoholic beverage sold in hypermarket as research subjects. First, the study categorized alcoholic beverage by the method of literature review. Then, the study conducted questionnaire surveys to gather consumers experience in drinking, and whether beverage packaging line up with its taste. Finally, the study analyzed the results and proposed suggestions, which may provide reference for alcoholic beverages packaging design.




### 3.1 Analysis on Subjects

The study collected a total of 26 subjects of alcoholic beverages from two categories – beer and fruit wine, according to the Enforcement Rules of the Tobacco and Alcohol Administration, Article 3. As a brand may make a series of fruit wines with several flavors, the

study select one flavor from each series of fruit wine as studying subjects.


（The Subjects of Alcoholic beverages analysis）

# 4. Results and Discussions

The survey was conducted on 19 women and 12 men, with 25 subjects aged from18 to 28, 5 subjects aged from 28 to 38, and 1 subjects aged from 38 to 48. There are 24 subjects have drinking experience and 7 subjects do not have any drinking experience. The findings on the influence of packaging on taste are summarized as below:

## 4.1 Real object pictures and descriptive texts make visual experience more consistent with tastes

Consumers are easily to know real tastes of beverages when fruit pictures and descriptive texts printed on packaging of beverages. The pictures of wheat make consumers associate that with the tastes of wheat and bitter. When the word of “Draft” printed on alcoholic beverages, consumers will considered them as draft beer or the taste of bitter. People with drinking experience and no drinking experience have similar sentiments on alcoholic beverages with real object pictures and descriptive texts on packaging.

## 4.2 Color affects consumers' perception of taste

In terms of color, 60% of consumers consider green packaging as the taste of bitter, which is consistent with color and taste association. 20% of consumers link white packaging with Calpis or bland taste, while 38% of consumers link it with bitter taste. Consumers with no drinking experience may guess the taste of contents based on its ingredients or packaging when they consume the beverages. Consumers with drinking experience are able to precisely describe

the taste of alcohol beverages based on its colors on packaging than those who do not have drinking experience, because colors on alcoholic beverages packing are served the similar function as descriptive texts of tastes on packaging. Consumers with no drinking experience are able to link colors with food tastes and use diverse words to describe tastes. Overall speaking, vibrant colors on packaging make consumers associate it with sweet taste, while dull colors on packaging associate with bitter taste.

### 4.3 Brands of Alcoholic beverages has no obvious effect on taste

Regarding brand identification, consumers with no alcohol drinking experience have different taste descriptions on brands, compared to those with experience. When consumers have consumed a specific brand of alcoholic beverages, it is hard for them to descript other brands of alcoholic beverages, which they have never consumed them. Most consumers guess the taste of alcoholic beverages based on pictures and words on packaging. The pictures of brand labels on alcoholic beverages are abstract to consumers with no drinking experience, so that they are hard to descript its taste.

According to the results of that study, consumers with drinking experience have better recognition of tastes for alcohol beverages than those who do not have drinking experience. Consumers with no drinking experience describe tastes by using diverse words based on its colors and texts on packaging. As for the suggestions for packaging design, pictures of the actual objects and texts on packaging make consumers' visual experience consist with taste sentiments. In addition, packaging colors also affect consumers' sentiments on alcoholic beverages. Therefore, actual objects pictures on aluminum cans of alcoholic beverages convey the messages of its tastes to consumers. When there is no picture on packaging, using color and taste association or specific words can help consumers understand it taste.

| Gender | Number |
|---|---|
| Female | **19** |
| male | **12** |

| Age | Number |
|---|---|
| 18-28 | **25** |
| 28-38 | **5** |
| 38-48 | **1** |

(Questionnaire survey statistics)

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# A Study on the Application of Turnover Rate in the Performance of High-Frequency Trading of Genetic Algorithm

Wen-Hsien Chen[a], Ping-Chen Lin[b,c]

## Abstract

In the study, a set of effective and scientific stock selection logic was expected to be established. It's logic was to apply the historical trading database of TWSE in Taiwan, and select 30 trading days in the recent two years at random. Stock portfolios meeting the strong bull condition were searched on each trading day and Bollinger Bands (BB) index was established based on the frequency of 5, 10, 15, 30, and 60 minutes with the data of each trading. Subsequently, parameter optimization was implemented by applying a genetic algorithm (GA). Trading statistics were implemented respectively to underlying stocks with Turnover Rate (TR), ShortSale／Margin (MS) ratio and Bid Ask (BA) ratio to select the specific stock portfolios of the highest returns, the most appropriate trading frequency and optimized parameter values.

Results show that among the three major features for stock selection, the rate of return of the stocks with the feature of TR ratio is significantly superior to that of the underlying stocks with other features. In terms of trading frequency, our results showed that a frequency of five minutes performed best among all chosen interval.

**Keywords:** Genetic Algorithm, High Frequency Trading, Volatility Bandwidth Index, Bollinger Bands.

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# 1. Introduction

Over the recent years, self-decision of high-frequency trading and program trading in the financial market has become increasingly popular. Therefore, the objectivity of an algorithmic process and the accuracy of trading decisions are of great importance for investors. In this study, a massive database was used to systematically summarize, calculate and analyze the best trading decision after back-testing and analyzing various strategies.

### 1.1 Research Motives

In the context of information asymmetry, investors can only implement “fundamental analysis”, “technical analysis”, “chip analysis” and “information analysis”. The above four categories of analysis were utilized to view the features of stock market performance, and three types of specific stocks were selected. Furthermore, a genetic algorithm (GA) was applied to calculate the optimal parameters of underlying stocks, in hope for the obtaining satisfactory trading performance.

### 1.2 Research Purposes

All investors in the financial market want to obtain high returns. In actual trading, however, only a small percentage of investors are rewarded. In order to best the market and make stable earnings, this study will concentrate on three main topics:

(1) Establish strict filtering criteria for stock selection, and identify underlying stocks meeting strong bull trend criteria as well as a high trading volume.

(2) Discuss three underlying features of the stocks: turnover rate, short-sale/margin ratio, and bid ask ratio. Additionally, calculate the optimal parameter values by applying GA, and identify the optimal feature for stock selection, in order to obtain a higher rate of return on investment.

(3) Demonstrate which trading frequency can be used for obtaining the optimal return on investment in high-frequency trading.

# 2. Material and Methods (or Experimental)

Relevant information on a certain date was traced to obtain stock price, trading volume, short-sale/margin ratio, turnover rate, bid ask ratio, and other features. Thirty trading days were selected through conditional filtering mode as base dates of the study. Altogether, 30 underlying stock portfolios were selected. The top 20 underlying stocks in terms of trading volume were used for studies, back-testing and demonstration.

### 2.1 Research architecture

The data used in this study was derived from “Real-time Quote Source of Taiwan Stock Exchange”, which is the Tick real-time stock market information source of the stock exchange. Operating procedures of the research framework are as shown in Figure 1.

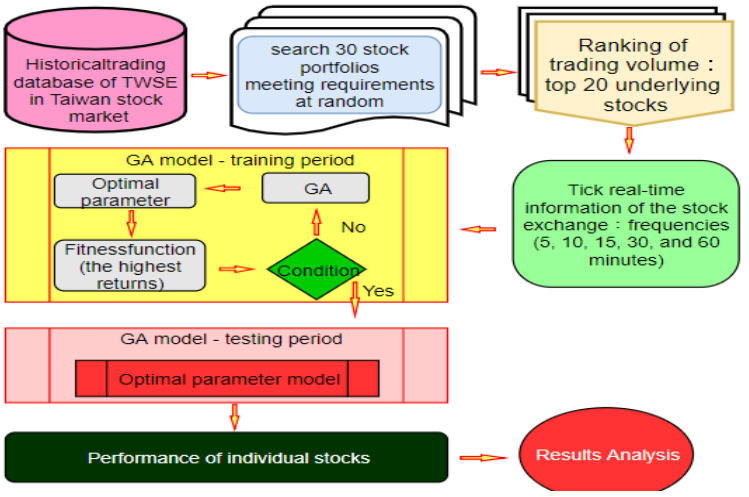


Figure 1. Schematic diagram of the research framework

### 2.2 Research Period

Literature suggests that one should choose the bull trend, consolidation trend and bear trend as the research period by ex-post theory means. But it is demonstrated that it is unable to determine which trend it falls within upon the future trading day. Therefore, above 3 trends were not considered during the study period (July1, 2016 to September 12, 2017).

### 2.3 Research Samples

A training period of 100 trading days and a testing period of 10 trading days was designed for each underlying stock portfolio. Subsequently, historical simulation was used to implement 10 back-tests in different intervals to each underlying stock portfolio to obtain the average value of the 10 back-tests.

Sliding windows method put forward by Lin (2014) in the “Application of Genetic Algorithm in Capturing the Turning Point and Volatility Signal of Stock Price Movements in Taiwan” was used in this study and data of the previous three months (about 100 days) was used as training data in each period as shown in Figure 2.

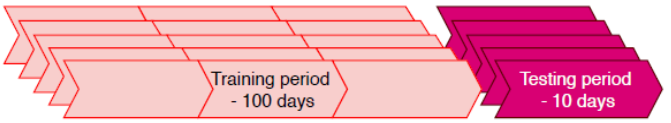


Figure 2. Research periods of training period and testing period

### 2.4 Trading Strategy

The strategy selected in this study was the technical index combination of volatility index and volatility index %b.

In the process of evolution, threshold values of technical indexes generated by GA were regarded as buying or selling signals. In order to obtain the maximum value of profit factor, buying conditions and selling conditions are as follows:

**Buying conditions:**

1. Bull transaction other than bear transaction is allowed in the process of trading.
2. The opening price of the next K bar upon the presence of buying signal is regard as the transaction price.
3. Brokerage fee should be undertaken in trading; 0.1425%/2 of transaction price is regarded as trading cost.
4. Upon the presence of buying signal of the index, holding is allowed only when expansion of Bandwidth index is required.

**Selling condition:**

1. In the context of buy & hold, buying is not allowed any more in case of the presence of buying signal again. Also buy & hold is not allowed until selling.
2. Holding is allowed upon the presence of buying signal of the index and selling is allowed upon the presence of selling signal of the index.
3. Closing price of current K bar is regarded as selling price and selling time upon the presence of selling signal.
4. Brokerage fee should be undertaken in selling; 0.1425%/2 of transaction price is regarded as trading cost.
5. Securities transaction tax should be undertaken in selling; 0.3% of transaction price is regarded as trading cost.
6. If there is absence of selling signal from holding to the end of the period, stocks should be sold at the transaction price, i.e. being the closing price of the last K bar during the period.

## 2.5 Key Performance Indicators

### Profit Factor

The profit factor is obtained by dividing gross win by gross loss, indicating the amount of profit to be generated per loss of NTD1. Therefore, the higher the profit factor is, the better the trading performance will be. This relation is shown in Eq. (1).

$$\mathbf{PF} = \frac{\mathbf{Gross\_win}}{\mathbf{Gross\_lose}} \tag{1}$$

PF: Profit factor Gross_win: GW Gross_lose: GL

Return on Investment (ROI) During Market Index

ROI is obtained by dividing the (Market End Index - Market Beginning Index) by Market End Index × 100%, as shown in Eq. (2).

$$\mathbf{ROI}(\%) = \frac{\mathbf{Market\_End\_Index} - \mathbf{Market\_Beginning\_Index}}{\mathbf{Market\_End\_Index}} \tag{2}$$

ROI : Return on investment during market index

Market_Beginning_Index: MBI Market_End_Index: MEI

## 2.6 GA

The combinatorial coding method as well as the basic computing architecture of the algorithm was adjusted in this study. Specific contents and improvements are as shown in Figure 3.

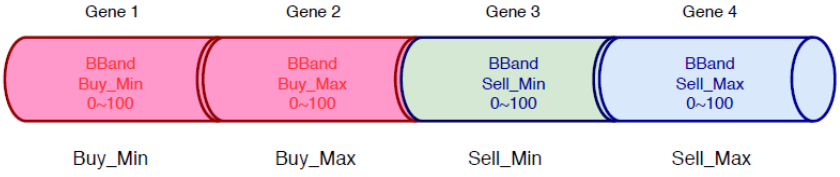


Figure 3. Encoding chromosome and parameters

## 2.7 GA Selection Method

In this study, parameters of selection method, crossover, mutation, termination condition of GA and others are set as shown in Table 1.

Table 1. Setting of parameters of GA

| Parameter name | Value |
|---|---|
| Coding scheme | Real number coding |
| Length of chromosome | 10 |
| Initial Population | 500 |
| Selection method | Competition method |
| Crossover method | Double-point crossover |
| Crossover rate | 0.5 |
| Mutation rate | 0.002 |
| Evolution algebra | 50 |
| Termination condition | Evolution algebra, community convergence |

# 3. Results and Discussions

In this study, experimental performance comparison was implemented to features, including turnover rate, short-sale/margin ratio, and bid ask ratio. Analysis and comparison were implemented with the performance of market index. The application of performance result generated by GA is described below.

The ROI during the following periods is significantly superior to that of the market index. In particular, the ROI of turnover rate is superior to the market index ROI as shown in Table 2.

Table2. Comparison of performance during the 5 minutes-frequency testing period in each research period with the market index

| Recent trading days | ROI of market index | Turnover rate | Shortsale/margin ratio | Bid ask ratio |
|---|---|---|---|---|
| Nearly 200 days | 0.629 | 3.614 | 2.640 | 1.352 |
| Nearly 210 days | 0.655 | 4.130 | 2.778 | 1.295 |
| : | : | : | : | : |
| Nearly 290 days | 0.554 | 3.133 | 2.096 | 0.779 |
| Nearly 300 days | 0.632 | 3.003 | 2.005 | 0.806 |

Paired sample t-tests were implemented to the ROI during the 5 minutes-trading frequency testing period and the ROI of market index and results show that ROI of top 5 turnover rates and short-sale/margin ratios is significantly superior to that of the market index and only ROI of bid ask ratio is not significantly superior to the market index ROI. as shown in Table 3.

Table 3. Paired sample t-tests of ROI during the 5 minutes-frequency testing period with the market index

| Recent trading days | Top ten turnover rates | Top ten short-sale/margin ratios | Top ten bid ask ratios | Recent trading days | Top five turnover rates | Top five short-sale/margin ratios | Top five bid ask ratios |
|---|---|---|---|---|---|---|---|
| Nearly 200 days | 0.0695 | 0.0400* | 0.1173 | Nearly 200 days | 0.0278* | 0.0313* | 0.2236 |
| Nearly 210 days | 0.0377* | 0.0306* | 0.1011 | Nearly 210 days | 0.0144* | 0.0207* | 0.2406 |
| : | : | : | : | : | : | : | : |
| Nearly 290 days | 0.0422* | 0.0436* | 0.1138 | Nearly 290 days | 0.0229* | 0.0243 | 0.3728 |
| Nearly 300 days | 0.0590 | 0.0451* | 0.1454 | Nearly 300 days | 0.0299* | 0.0373 | 0.3983 |

1. Values listed in the table are the values of p in paired sample t-tests
2. **and* refer to the significant level of paired sample t-tests at 1 % and 5 % respectively

The frequency of 5 minutes is regarded as the optimal option among all trading frequencies. Liquidity of stock trading is lower than FITX. Therefore, unstable ROI will result from trading at a high frequency of 1 minute.

As shown in Table 4, in the experiments using various frequencies, the best performance is observed in the frequencies of 5, 15, and 30minutes, while poor performance is observed in frequencies of 10 and 60 minutes.

Table 4. Performance of various frequencies during testing period

| Recent trading days | 5 minutes | 10 minutes | 15 minutes | 30 minutes | 60 minutes |
|---|---|---|---|---|---|
| Nearly 200 days | 3.614 | 1.356 | 2.391 | 2.454 | 1.101 |
| Nearly 210 days | 4.130 | 1.721 | 2.810 | 2.651 | 1.502 |
| : | : | : | : | : | : |
| Nearly 290 days | 3.133 | 1.119 | 2.245 | 2.342 | 1.247 |
| Nearly 300 days | 3.003 | 1.028 | 2.131 | 2.242 | 1.154 |

# 4. Conclusions

In this study, the trading model suitable for high-frequency trading and expecting a stable ROI was demonstrated. The study is an application of modern financial technologies. In the process of applying GA for identifying the optimum parameters and strategies and other studies, it was found that all the following conditions must be satisfied at the same time if stable returns and earnings are to be obtained in high-frequency trading, which is also the most important conclusion of the study:

1. Among the three stock features, the ROI and stability of turnover rates index are the best, followed by short-sale/margin ratio and bid ask ratio. It is demonstrated through paired sample t-tests that ROI of turnover rates is the most significant. It is also demonstrated that the stocks suitable for day trading need to be strictly selected among underlying stocks featuring high turnover rates, then efficient and stable returns can be achieved.
2. Among the five frequencies, 5, 10, 15, 30, and 60 minutes, it is demonstrated that ROI of the frequency of 5 minutes is superior to that of transactions at other frequencies.
3. It is demonstrated that performance in approximately 200 to 300 trading days is the best. In particular, 210 trading-day is the optimum back-testing period.

In future studies, GA and other algorithms, as for example support vector machines and neural networks, can be applied to compare their stock price predicting capability and accuracy. GA can then be further applied in the paired trading of financial products.

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# The Study of Relation among Green Consumption Awareness, Product Attribute, and Green Product Purchase Intention in University's Students of India

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## Abstract

This study explores the relation among green consumption awareness, product attribute, and green product purchase intention in University's Students of India. The survey research method is used and issue 1,000 questionnaires, 923 valid questionnaires are collected. It shows that the students in Delhi do have a significantly higher score in green consumption awareness, product attribute cognition, and green product purchase intention than in the region of Gaya. Those with a high awareness of green product consumption do have a higher intention to purchase green product than those with low awareness of green product consumption. For the product attribute, utility attributes such as price, performance, and quality are the biggest factors of consideration. Moreover, when university students purchase green products, green consumption awareness and product attribute do have 31.2% explanation power for green product purchase intention.

**Keywords:** India, university student, green consumption awareness, product attribute, green product purchase intention.

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# 1. Introduction

The twenty-first century is an era of green and sustainable development competition. In order to protect the environment and ecology, countries not only improve the national environmental protection norms but also propose a series of reforms. Environmental problems, such as global warming, air pollution are a continually growing concern worldwide. According to WPP Global Green Brands Study in 2011, green household products and groceries have the highest adoption rates of all consumer-goods categories in six of the eight countries. Consumers around the world are getting smarter about going green and are looking to buy more environmentally sensitive products, and 60% of consumers indicate that they are willing to buy products from companies with environmental responsibility [1]. Recently, big cities in India have suffered from air pollution. Every year, 30,000 people in New Delhi die from air pollution. Environmental issues are also highly valued in India [2]. The source of all consumer behavior is consumers. Consumers may not understand the importance of the green environment at the beginning, or they may not know that the production process will break the global environment and purchase many products that were less environmentally friendly in the past. However, due to the reports of the mass media, consumers gradually understand the importance of the green environment. The awareness of green environmental protection has a tendency to rise.

In today's era of green consumption, when consumers adopt green products, can they have enough purchasing intention to buy green products? In addition, what factors will affect consumers' intention to buy green product. In order to answer these questions, the factors that influence consumers' intention to purchase green products have become the main motivation of this study. In addition, university students receive more information and knowledge; they will still become leaders in society in the future. Therefore, this study will use university students as research objects.

# 2. Literature Review

According to Hirose [3], environmentally friendly behavior is determined by goal intentions and behavioral intentions. Goal intentions are influenced by perceived environmental risks; a sense of crisis caused by environmental pollution, and believe that taking action to save the environment from pollution and destruction is necessary. Behavioral intentions are influenced by assessments of feasibility, whether people have adequate knowledge or skills to evaluate environmental, social norms, and cost versus profit. Awan and Wamiq [4] pointed out that there is a positive relationship between environmental awareness and green marketing and there is a bright chance of potential marketing of green products and services in Pakistan.

Tullani, Saha & Dahiya [5] conducted an empirical survey recently in India showed that the green innovation and ethical responsibility are significantly associated with green purchase intention, and both factors conjointly affect consumer's green purchase intentions. In addition, Fatah Uddin. & Khan[6] used a convenience sampling method and obtain 730 usable responses from young students of India in 2018, revealed that the environmental attitude of young consumers directly affects their green purchasing behavior and that environmental attitude is itself shaped by the altruistic, individual, and environmental characteristics of young consumers.

# 3. Methodology

## 3.1 Research framework

The research framework of this study is shown in Fig.3-1.

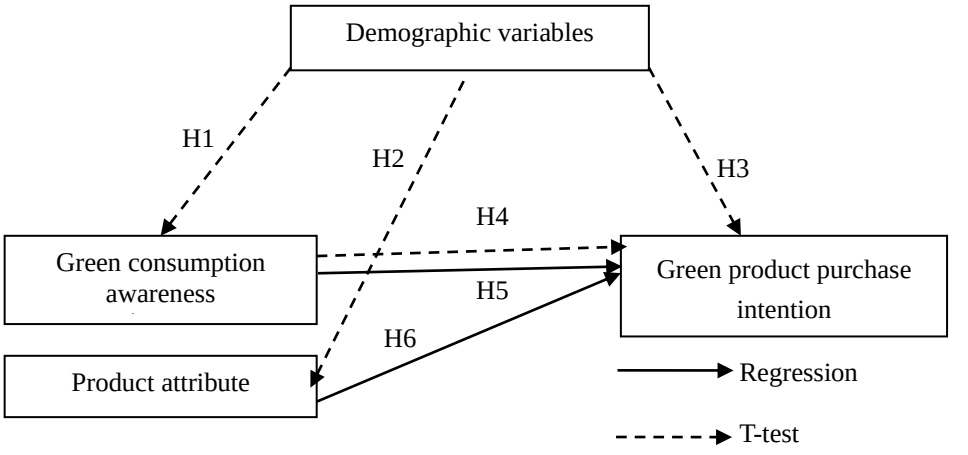


Fig.3-1 Research Framework

## 3.2 Hypothesis

This study aims to understand the relations among green consumption awareness, product attribute cognition, and purchase intention, and whether it will vary due to demographic variables of Indian university students. Therefore, the following hypotheses are proposed:

- H1. Demographic variables have significant differences in green consumption awareness.
  - ◆ H1-1 Gender has significant differences in green consumption awareness.
  - ◆ H1-2 Year has significant differences in green consumption awareness.
  - ◆ H1-3 Monthly disposable income has significant differences in green consumption awareness.
  - ◆ H1-4 Area has significant differences in green consumption awareness.

- H2 Demographic variables have significant differences in product attribute cognition.
  - ◆ H2-1 Gender has significant differences in product attribute cognition.
  - ◆ H2-2 Year has significant differences in product attribute cognition.
  - ◆ H2-3 Monthly disposable income has significant differences in product attribute cognition.
  - ◆ H2-4 Area has significant differences in product attribute cognition.
- H3 Demographic variables have significant differences in green product purchase intention.
  - ◆ H3-1 Gender has significant differences in green product purchase intention.
  - ◆ H3-2 Year has significant differences in green product purchase intention.
  - ◆ H3-3 Monthly disposable income has significant differences in green product purchase intention.
  - ◆ H3-4 Area has significant differences in green product purchase intention.
- H4. The level of green consumption awareness has significant differences in green product purchase intention.
- H5. Green consumption awareness has a significant influence on green product purchase intention.
- H6. Product attribute will affect green product purchase intention
- H7. If product attributes affect the intention to purchase green products, the impact of utility attributes is greater than the trend attributes.

### 3.3 Research Instrument

To measure green consumption awareness, since many studies have been developed using the environmental 4R principle in the past, the 8-item scale which was modified from the Green Consumer Behavior Scales of Li and Luo [7, 8]. Such as I will buy recycled paper, recycled paper notebooks, etc., have the habit of bringing my own shopping bag, will reuse plastic bags etc., will use recyclable containers, will consider the need to avoid buying too much discounted items at the time of promotion, will avoid buying over-packaged goods, will avoid using Styrofoam tableware, I will follow garbage classification. In term of green product attribute scale, a 6-item scale was developed. Such as I pay attention to the price in purchase of a product, pay attention to the function, pay attention to the quality, pay attention to the brand, pay attention to the fashion, pay attention to the exterior attraction. The study divides product attributes into "utility" (function, quality, and price) and "trend"(brand, fashion, attraction) two categories. In term of green product purchase intention, the 4-item scale was developed. Such as, I am willing to buy products that have less pollution to the environment, willing to buy more

energy-efficient products, willing to buy products with the concept of environmental protection, to recommend my relatives and friends to buy products with environmental protection concept. The scales are scored on a 5-point Likert scale ranging from strongly disagree (1) to strongly agree (5). The reliability of Cronbach α in this study is between 0.626 ~ 0.756, as shown in Table3-1, which is in good or acceptable result [9].

Table3-1 The reliability of Cronbach α

| Scale | Item | Cronbach's α |
|---|---|---|
| Green consumption awareness | 8 | 0.636 |
| Product attribute | 6 | 0.626 |
| Product purchase intention | 4 | 0.756 |
| Total | 18 | 0.921 |

# 4. Results and Discussions

The authors personally went to the university campus and classroom to issue questionnaires A total of 1000 questionnaires were distributed to the student of University of Delhi, Magadh University and Gaya College in Gaya area, Bihar. Totally 923 valid questionnaires were collected. The distribution of the sample is shown in Table 4-1. In addition, the descriptive statistical analysis of each scale is shown in Table 4-2.

Table4-1 Demographical profile of the sample

| Background | Attribute | N | Percentage |
|---|---|---|---|
| Gender | Male | 478 | 51.8% |
| | Female | 426 | 46.2% |
| Year | Undergraduate | 451 | 51.0% |
| | Postgraduate | 433 | 49.0% |
| Monthly disposable income | Below3,600 Rs | 366 | 49.7% |
| | 3,601 Rs and above | 370 | 50.3% |
| Area | Delhi | 507 | 54.9% |
| | Gaya | 416 | 45.1% |

N<923 owing to missing data

Table4-2 Descriptive statistical analysis of the scale

| Scale | N | M | S.D. |
|---|---|---|---|
| Green consumption awareness | 919 | 3.86 | .537 |
| Product attribute | 918 | 3.91 | .562 |
| Product purchase intention | 922 | 4.29 | .669 |

N<923 owing to missing data

### 4.1 Significant Test of Background Variable in Each Scales

The significance test of background variable in green consumption awareness, product attributes, and green product purchase intention is shown from Table4-3 to Table4-5.

Table4-3 Significance test of green consumption awareness

| Background | Attribute | N | M | T value | Significance |
|---|---|---|---|---|---|
| Gender | Male | 476 | 3.83 | -1.52 | 0.128 |
| | Female | 424 | 3.86 | | |
| Year | Undergraduate | 450 | 3.86 | 0.66 | 0.51 |
| | Postgraduate | 430 | 3.84 | | |
| Monthly disposable income | Below3,600 Rs | 364 | 3.88 | 2.03* | 0.042 |
| | 3,601 Rs and above | 370 | 3.80 | | |
| Area | Delhi | 506 | 3.93 | 4.60*** | 0.000 |
| | Gaya | 413 | 3.77 | | |

*p<0.05, **p<0.01, ***p<0.001

Table4-4 Significance test of product attribute

| Background | Attribute | N | M | T value | Significance |
|---|---|---|---|---|---|
| Gender | Male | 475 | 3.91 | -0.02 | 0.982 |
| | Female | 425 | 3.91 | | |
| Year | Undergraduate | 449 | 3.99 | 4.07*** | 0.00 |
| | Postgraduate | 431 | 3.83 | | |
| Monthly disposable income | Below3,600 Rs | 365 | 3.94 | 1.55 | 0.123 |
| | 3,601 Rs and above | 367 | 3.88 | | |
| Area | Delhi | 506 | 4.44 | 7.66*** | 0.000 |
| | Gaya | 416 | 4.11 | | |

*p<0.05, **p<0.01, ***p<0.001

Table4-5 Significance test of green product purchase intention

| Background | Attribute | N | M | T value | Significance |
|---|---|---|---|---|---|
| Gender | Male | 477 | 4.26 | -1.66 | 0.097 |
| | Female | 426 | 4.34 | | |
| Year | Undergraduate | 450 | 4.40 | 4.93*** | 0.000 |
| | Postgraduate | 433 | 4.18 | | |
| Monthly disposable income | Below3,600 Rs | 366 | 4.34 | 1.82 | 0.070 |
| | 3,601 Rs and above | 370 | 4.25 | | |
| Area | Delhi | 506 | 4.44 | 7.66*** | 0.000 |
| | Gaya | 416 | 4.11 | | |

*p<0.05, **p<0.01, ***p<0.001

From Table 4-3 to Table 4-5, there is no significant difference in gender between green consumption awareness, product attributes, and green product purchase intention. The undergraduate students are significantly higher than the postgraduate students in terms of product attribute cognition, and green product purchase intention. In terms of green consumption awareness, the disposable income of 3,600 rupees or less is significantly higher than 3,600 rupees or above. The rest are not significantly different in terms of product attribute and green product purchase intention. The students in the Delhi area are significantly higher than the students in the Gaya region in terms of green consumption awareness, green product attribute cognition, and green product purchase intention. It is speculated that Delhi is the capital of India, with a high standard of living and easy access to information. Gaya is located in Bihar province, where the income is lower. Therefore, the hypothesis H1 to H3 are all partially accepted.

### 4.2 Green Consumption awareness and Green Product Purchase Intention

In order to understand whether Indian students with high green consumption awareness will have a higher willingness to purchase green products, this study first divides the sample into high and low groups according to the score of green consumption awareness. The average score of green consumption awareness is the cut-off point (M=3.8587). If it is lower than 3.85875, it is the low-green consumption awareness group. If it is higher than 3.85875, it is the high-green consumption awareness group. The result is shown in Table 4-6. In Table 4-6, the high green consumption awareness group is indeed significantly higher than the low green consumption awareness in terms of green product purchase intention. Therefore, hypothesis H4 is accepted.

Table4-6 Test of the high and low group of green consumption awareness in green product purchase intention

| | Group | N | M | T value | Significance |
|---|---|---|---|---|---|
| Green consumption awareness | low | 418 | 4.0096 | -12.340*** | 0.000 |
| | high | 500 | 4.5285 | | |

*p<0.05, **p<0.01, ***p<0.001

### 4.3 Product Attribute and Green Product Purchase Intention

In the hypothesis of this study, product attributes are divided into two parts: utility attribute cognition and trend attribute cognition. By regression analysis to understand the weight of the impact of the two on the green product purchase intention, the result is shown in Table 4-7. The tolerance of regression is 0.941, which is in the range of 0 to 1 recommended by

scholars, and VIF is also below 10 (1.063). Therefore, there is no problem with collinearity.

Table4-7 Product attribute regression analysis of green product purchase intention

| Module | Beta | T | Sig. | F | Sig. | $R^2$ |
|---|---|---|---|---|---|---|
| Utility attribute | 0.479 | 16.127 | 0.000 | 144.819 | 0.000*** | 0.241 |
| Trend attribute | 0.040 | 1.361 | 0.174 | | | |

*p<0.05, **p<0.01, ***p<0.001

It can be seen from Table 4-7 that consumers' perception of the utility attribute of green products ($\beta$= 0.479) has a significant impact on the intention to purchase green products. It can explain 24.1% of the purchase intention. However, the trend attribute cognition has no significant influence on product purchase intention. Therefore, hypothesis H7 is accepted.

### 4.4 The Relation among Green Consumption Awareness, Product Attribute, and Green Product Purchase Intention.

Correlation analysis of three major aspects of green consumption awareness, product attribute, and green product purchase intention is shown in Table 4-8. As can be seen from Table 4-8, there is a positive correlation among green product purchase intention, product attribute, and green consumption awareness.

Table4-8 Result of Pearson correlation analysis

| Pearson correlation (Sig.) | Green product purchase intention | Product attribute | Green consumption awareness |
|---|---|---|---|
| Green product purchase intention | 1 | | |
| Product attribute | 0.400(0.000) | 1 | |
| Green consumption awareness | 0.503(0.000) | 0.348(0.000) | 1 |

By regression analysis to understand the weight of the impact of product attribute and green consumption on the green product purchase intention, the result is shown in Table 4-9. The tolerance of regression is 0.880, which is in the range of 0 to 1 recommended by scholars, and VIF is also below 10 (1.137). Therefore, there is no problem with collinearity.

Table4-9 Result of regression analysis to Green product purchase intention

| Module | Beta | T | Sig. | F | Sig. | $R^2$ |
|---|---|---|---|---|---|---|
| Green consumption awareness | 0.412 | 14.048 | 0.000 | 204.817 | 0.000*** | 0.310 |
| Product attribute | 0.258 | 8.798 | 0.000 | | | |

*p<0.05 **p<0.01 ***p<0.001

Table 4-9 shows that product attribute and green consumption awareness have an influence on the intention to purchase green product, therefore hypothesis H5 and H6 are both accepted. In addition, green consumption awareness is greater than the consideration of product attribute, and both can explain 31% of the green product purchase intention

# 5. Conclusion

This study found that the green consumption awareness of Indian college students is in the upper-middle degree. In the Likert 5 scale, between "agree" and "normal", but the research sample is generally highly recognized for the intention to purchase green product, with the answer between "agree" and "strongly agree". Students at Delhi area have higher green consumption awareness, product attribute cognition, and green product purchase intention than those in the Gaya region. It can be seen that those concepts will vary depending on the level of living in the region and whether the economy is developed or not.

The results of the study show that product attribute and green consumption awareness both have an influence on the intention to purchase green products. In addition, those with a high awareness of green product consumption have a higher willingness to purchase green products than those with lower green product awareness. For product attribute, the practical attributes such as price, function, and quality are the biggest factors of consideration. With the rapid development of India's economy, air pollution and other issues are gradually being valued. The business opportunities for green products in the future can be expected. Therefore, the enterprise can follow the direction of this research to do marketing of green product and strengthen its recognition of green product; it will be conducive to the development of green product.

# Acknowledgments

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# （Short Communication）

# Case Study of Sustainable Agritourism Development on Farming and Food Education in Changhua Erlin

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## Abstract

Ecological sustainability is becoming generally more important and popular throughout the world. Farming and food education is also developing and needs more promotion in agritourism via ecotour experiential activities and educational programs. The study aims to find an appreciation of the linkages between agritourism and community-based tourism (CBT) to enable farming and food education to achieve ecological sustainability. In order to survey how community-based tourism contributes to agriculture and sustainability through farming and food experiential activities, the survey has been focused on interaction with the individuals investigated through 9 interviews from three farm managers, three government employees, and three tourists. The interviews primarily included questions about the farming, ecotour experiential activities and educational programs. The paper attempts to discuss the agritourism, CBT and implications of the farming and food experiential activities. The results showed that farming and food educational experiences provided participants with more awareness of issues and trends about ecological sustainability, agritourism, a sense of CBT sociability, and the youth returning home, as well as an appreciation of the linkages between farming and safe food. Farming and food education is still developing in Taiwan. The youth returning home also needs more professional training and government support. This study concludes that a comprehensive farming and food education program might rely on CBT and the youth returning home, which provides farming experiences, food safety, and ecological education in sustainability about respecting the environment.

**Keywords:** Ecological Sustainability, Farming and Food Education, Agritourism, Community-Based Tourism (CBT), Youth Returning Home.

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# 1. Introduction

In Taiwan, the development of community-based tourism along with more DIY (Do It Yourself) in agritourism and ecotour experiential activities for students and visitors, is the policy of Taiwan's government. Taiwan's government also encourage the youth returning home as farming entrepreneurs in the rural rejuvenation plan to improve traditional farming business models. Agritourism development on farming and food education in Changhua Erlin Recreation Agriculture Area is an example to promote its famous agricultural products such as grapes, pitayas and buckwheat. Erlin Farmers' Association of Changhua (Liu, Chen, Yang & Chiang, 2007) has placed a focus on the community-based tourism.

Recent studies have discussed the community-based tourism (Hunt & Stronza, 2014; Lundberg, 2015), and have systematically examined the relationship between agritourism and ecological sustainability. However, relatively few studies have been conducted on community-based tourism and farming and food education. To fill these research gaps, the study aims to develop a theoretical model to examine the relationships among community-based tourism, farming and food education in agritourism, ecotour experiential activities, ecological sustainability and the youth returning home.

# 2. Literature review

Community-based tourism (CBT) has been introduced in many countries (Dodds, Ali, & Galaski, 2018; Lepp, 2007) and considered as a viable option for developing local economies by enhancing economic benefits for community residents. In Taiwan, community-based tourism is linked to both farming and food education in agritourism via ecotour experiential activities for ecological sustainable development. Previous scholars have explored sustainability indicators for measuring the sustainable development of CBT (Lee & Hsieh, 2016). From several perspectives of stakeholders such as visitors, residents, for-profit organizations, government entities, non-profit organizations, and the environment, dimensions for measuring the sustainability of CBT may include ecological, political, technological, social, cultural, and economic indicators (Lee & Jan, 2019).

To achieve the sustainable development of CBT, residents should be provided with life satisfaction sustainability (Lee & Jan, 2019) in terms of material, emotional, health and safety well-being (Woo, Kim, & Uysal, 2015). If residents are satisfied and supportive, CBT will be more likely to succeed. CBT is dependent on local resident involvement, through their roles as employees or local entrepreneurs, and on resident attitudes towards tourists (Lundberg, 2015).

In addition, for economic sustainability, managers of CBT may provide educational

services and farming experiences that will increase tourists' satisfaction and create new income sources in some agricultural communities. Farming and food education is therefore a suitable way to attract customers and increase income. With the government financial and technological support, the youth returning home is strongly encouraged to bring new ideas, energy and enthusiasm for farming rejuvenation.

## 3. Methods

The primary data collection involved semi-structured, in-depth interviews undertaken with 9 respondents and data were analyzed using content analysis. In order to capture the widest variety of local and regional viewpoints on the implementation of community-based tourism and ecological sustainability, different stakeholders such as three farm managers, three government employees, and three visitors were included. The interviews primarily included questions about the farming, ecotour experiential activities and educational programs.

Data were mainly collected during November and December, 2018. One of the primary researcher has worked as a tour teacher for 10 years in community university and keeps a close relationship with the tourism industry in Erlin Recreation Argiculture Area, hence having the advantages of persistent observation and prolonged engagement that can enhance the credibility of the study.

## 4. Results and Discussions

This study focuses on a CBT project conducted by Erlin, which is the largest township in Changhua County with an area of 92.85 square kilometers and was originally a traditional agricultural community. The interviews conducted in Changhua Erlin Recreation Agriculture Area indicate the following statements:

(1) Previous studies have suggested that CBT is an effective method of alleviating poverty (Dodds, Ali, & Galaski, 2018). Three government employees indicate that CBT plays an important role in poverty alleviation because CBT contributes to economic benefits and community development.

(2) Three farm managers mentioned that CBT needs more marketing promotion and support from government. The government may provide a training to increase motivation for developing farming and food education. Managers also mentioned that the community stakeholders should be better integrated so that everyone could benefit from a network of the cooperation.

(3) Three visitors indicate the experiential activities could provide participants with more awareness of ecological sustainability, food safety and a sense of CBT sociability. In

addition, most of the visitors understand the farmer's hard work after the farming experience and are willing to continue to participate in relevant courses in the future. Participants also consider purchasing more local agricultural product items to reduce food carbon footprint.

(4) The youth returning home is the essential of young farmers for the key to the transformation of future agriculture and rural development in Taiwan. These young managers or entrepreneurs need more government support and professional training to be the guides of ecotour experiential activities as well as coordinators making the linkages between farming and safe food.

Based on the preceding literature review and interview analyses, this paper proposes a synthetic framework for how community-based tourism contributes to farming and food education and ecological sustainability through ecotour experiential activities via governmental support and the youth returning home in Figure 1. This study extends the knowledge of community-based tourism (CBT) development and makes a significant contribution to the farming and food education and awareness of ecological sustainability development.

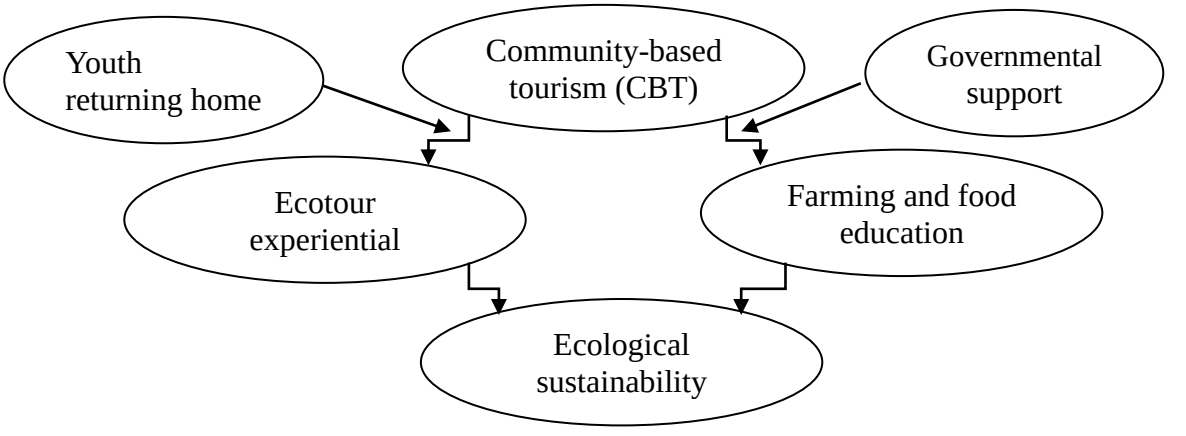


Figure 1 A model of community-based tourism on farming and food education

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# SPECIAL ISSUE OF HSIUPING JOURNAL

## Vo1.2

# Effect of Pyrolysis Temperature on the Physicochemical Properties of Produced Biochar from Rice Straw

Duangkamol Ruen-ngam[a], Prangtip kaewpengkrow[a*], Atthavute Ruenruengjai[b]

## Abstract

Rice straw is an abundant and potential plant waste to produce biochar by pyrolysis. The objective of this study is to investigate the structure and physicochemical properties of biochar from pryrolyzed rice straw. The rice straw was pyrolyzed at 300, 400, 500 and 600 °C. In the pretreatment of rice straw, it was pre-treated with 1M sodium hydroxide and stirring for 1h. The highest bio char yield of 56 % wt. was obtained by pretreated biochar at 500 °C. The proximate analysis was also investigated which contained the moisture, volatile, fix carbon and ash content. Characterization of functional groups of biochar was conducted using FTIR spectrophotometer. Biochar and pretreated biochar were also investigated the fuel properties in term of high heating value. The high heating value of the biochar increased from 12.16 MJ/kg to 27.23 MJ/kg in the pretreated biochar at 500 °C. The result suggested that the pretreated rice straw has a higher reaction of carbonization and decrease the ash content. The chemical energies of solid fuels are stored in fixed carbon and volatile matter. Consequently, a great amount of rice straw is applied, it can reduce amount of GHG from open burning.

**Keywords:** Rice Straw, Pretreatment, Bio-Char, Pyrolysis.

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# 1. Introduction

Rice is a major agricultural residue especially in south and South-East Asia including Thailand. The estimated rice straw production amounts to approximately 740.95–1111.42 million tons per year. Currently, rice straw is frequently disposed by burning, which considerably increases the level of environmental pollution. Pyrolysis is a process that decomposes organic materials thermally under oxygen-free conditions in the temperature range of 300–900 C [1-2]. It has been widely applied in the preparation of bio-oil and biochar products from rice straw conversion. Biochar is a carbon-rich solid product derived by pyrolyzing biomass with limited or no oxygen [3]. It may be added to soils where, potentially, it can act to maintain or improve soil and agronomic functions. Compared with biochar generated by burning, biochar of rice straw produced by thermochemical means are promising because of their high lignocellulose content. There are many biomasses that could serve as biochar feedstock, such as crop residues, wood biomass, animal litters and solid wastes [4-8]. Biochar has a great potential to absorb environmental contaminants due to its wide availability of feedstocks, low-cost and favorable physical/chemical surface characteristics, such as a large specific surface area, microporous structure, active functional groups, and high pH [3, 7]. Moreover, biochar can be used as a catalyst directly or as a precursor for making catalyst in the fields of syngas cleaning, conversion of syngas into liquid hydrocarbons and biodiesel production [9]. Bio-char also can be used as an energy source in combustion and co-firing processes in coal-based power stations because of its excellent fuel properties such as high energy density and good grind ability [10].

Generally, rice straw is composed of heterogeneous complex of carbohydrate polymers. Therefore, it is necessary to have a pretreatment process to destroy or break some lignin by the chemical pretreatment , thermal methods and their combinations [6]. There are some studies shows that straw must be properly pre-treated in order to guarantee the quality of the final product [4, 11]. Commonly, alkali metals in rice straw play the most significant role in the rate of devolatilization and have a clear catalytic effect on char burnout. The simple leaching with acid or base solution resulted in the reduction of ash content and increasing in HHV. Furthermore, calcium hydroxide, sodium hydroxide, and potassium hydroxide are generally used for alkali pretreatment of lignocellulose. The objective of this study is to investigate the physicochemical properties (surface functional groups) and the fuel properties of biochar (mass yield, energy yield, high heating value; HHV) from pyrolyzed and pretreated rice straw. Based on the results, considerations required for application of the pyrolyed rice straw were discussed

and explored the theoretical basis for future industrial uses of pyrolysis technology from rice straw biochar.

# 2. Methods or Experimental

## 2.1 Material

Rice straw (RS) was obtained from a farm in the Nakornphatom province in Thailand. All feedstock samples were firstly air dried and then ground to 1-3 mm. Then, the power samples were dried in an oven at 105 °C for 24 h and finally stored in jars at room temperature. The rice straw was leached with 1M sodiumhydroxide (at a 2:1 solution: rice straw ratio) and stirring for 1h to obtained pretreated rice straw (PRS). After impregnation, all samples were dried in an oven at 105 °C for 24 h, and then sealed in desiccator for analyzing.

## 2.2 Pyrolysis Experiment

The specified amount of RS and PRS samples were pyrolyzed at 300, 400, 500, and 600 and °C, respectively. They were put into a crucible with a lid and placed in a muffle furnace. The temperature increasing rate was set at 10 °C/min. After reaching the target temperature, the sample was kept in the operating furnace for 2 h (residence time). The biochars were then removed from the furnace, cooled in a desiccator, weighted and stored in airtight plastic containers. The yield of biochar ($Y_1$) was determined as the ratio of the produced biochar weight to the weight of pyrolysis feedstocks and can be calculated as the following formula:

$$Y_1(\%) = M_1/M_2 \times 100 \quad (1)$$

where $M_1$ is the weight of pyrolyzed rice straw sample; M2 is the weight of Rice straw

## 2.3 Characteristic of raw material

The proximate analysis was performed following ASTM to classify the sample in terms of moisture (ASTM E871), volatile matter (ASTM E872), fixed carbon (ASTM E872) and ash (ASTM D1102/D3174-04). Fourier transform infrared (FTIR) spectra of the biomass and biochar samples were obtained by a Perkin Elmer Spectrum100 spectrometer in transmittance mode, with scanning frequencies from 4000 to 600 cm-1wave number range to determine their functional groups. To qualitatively examine size and shape of biochar particles, the photograph of biochar particles was captured under a microscope with a maximum zoom of 1:50 (Stereo Discovery.V20, Zeisss, Germany). The photomicrograph of rice straw and fine biochar are shown in Fig. 1. The biochar displayed powder structures and regular shapes. The result showed that the particle size of biochar from pyrolyzed rice straw were approximately 400 μm.

The volume of mesopores and the specific surface area in the biochar would be analyzed in the future work.

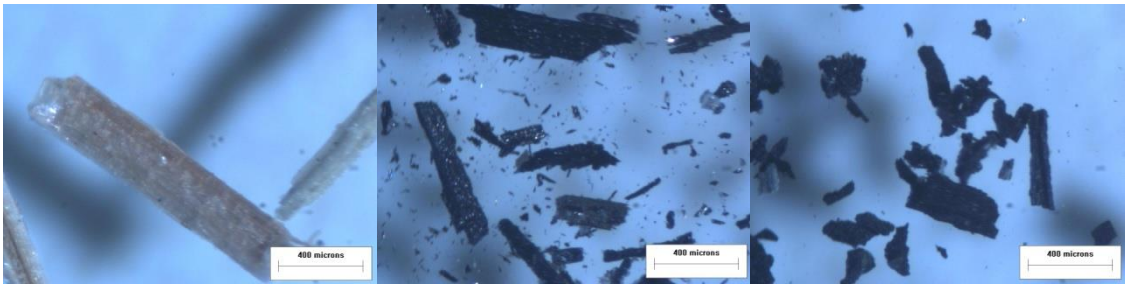


Fig. 1 Photomicrograph of (a) Rice straw (b) fine biochar, (c) fine pretreated biochar

# 3. Results and Discussions

### 3.1 Bio char yield

Generally, the pyrolysis and gasification processes yielded three different product phases: solid (char), liquid (tars) and gas [2, 12]. The yields of produced biochars at different pyrolysis temperatures are presented in Fig.2. The yields of derived biochars from the pyrolysis of RS at temperatures from 300 to 600 °C and were in range of 22.79 -28.02% wt. The highest biochar was obtained at the pyrolysis temperature of 500 °C. The result suggested that the increasing pyrolysis temperature to from 300- 500°C was not significantly decreasing in biochar yield while it was clearly reduced at 600°C.

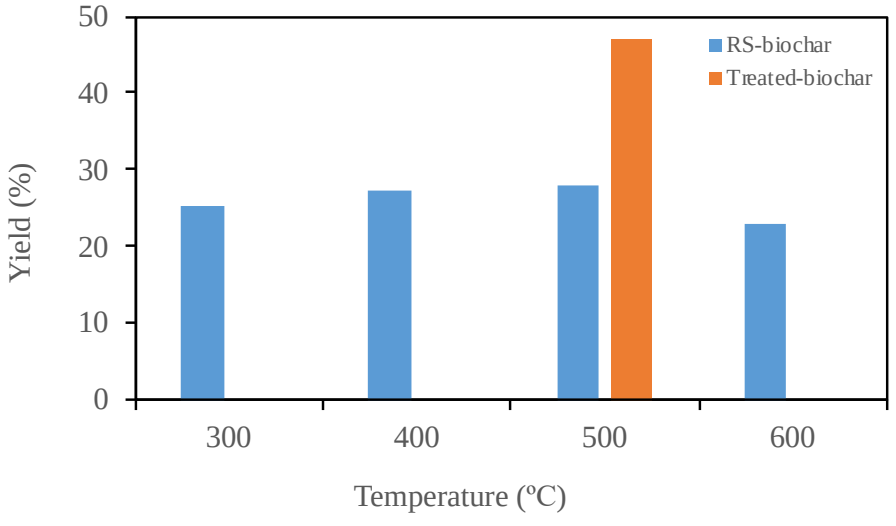


Fig. 2. The yields of biochar products at different pyrolysis temperatures

In pretreatment of rice straw, biochars yield from the pyrolysis of RS at 500°C was sharply increased to 46.88 %wt. The result suggested that pretreatment with basic solution can improve the properties of rice straw by leaching the alkali in the rice straw. It can be concluded that the pyrolysis at low temperatures produced high yield of biochar which can be applied a pretreated rice straw for palletization to co-combustion, catalyst or adsorbed material in the industrial.

### 3.2 Properties of biochars

The straw sample used in this study was from a farm in Thailand. Properties of rice straw feedstock comparing with other works are summarized in Table 1. The ash content was lower compared to the values in the literature (15.48–23.55 %). Also, the volatile matter (VM) to fixed carbon (FC) ratio was higher in this sample, which can lead to larger char yields.

Table 1 Characteristics of rice straw (RS) comparing with other works

| Characteristics of rice straw | Park2014 | Nam 2015 | Im-orb 2016 | Liang 2017 | Tran 2018 | This work |
|---|---|---|---|---|---|---|
| Proximate**(%**wt**)** | | | | | | |
| Moisture | 7.30 | 9.2 ± 0.1 | 6.71 | - | 9.31 | 8.754 |
| Volatile | 60.84 | 69.3 ± 0.1 | 58.64 | 73.23 | 68.72 | 70.73 |
| Fix carbon | 16.61 | 9.01 ± 0.96 | 11.09 | - | 15.80 | 7.49 |
| Ash | 22.55 | 21.7 ± 1.1 | 23.55 | - | 15.48 | 13.02 |
| HHV MJ/kg | - | 14.2 | - | - | 12 | 12.16 |

The proximate analysis of rice straw (RS) and derived biochars as shown in Table 2. The proximate analysis was performed following the ASTM procedure to classify the sample in terms of the moisture (ASTM E871), volatile matter (ASTM E872), fixed carbon (ASTM E872) and ash (ASTM D1102) contents. The chemical energies of solid fuels such as biomass are stored in fixed carbon (FC) and volatile matter. VM is an index of the gaseous fuels of biomass. In addition, VM and FC are represented the combustible fraction of the fuel and together provide an indication of the value of the fuel. As the pyrolysis temperature from 300 to 600 °C, the content of VM in biochars continuously reduced, while the ash content increased. The reason for this phenomenon was that more organic matter would be decomposed and converted at higher pyrolysis temperature. Naturally, the biochars derived from biomass such a rice straw had higher content of carbon and hydrogen. Bio-char has been tested and can be used as an energy source in combustion and co-firing processes in coal-based power stations because of its excellent fuel properties such as high energy density and good grind ability [9].

Table 2 Proximate analysis of rice straw (RS) and derived biochars.

| Temperature (°C) | | 300 | 400 | 500 | 600 | Pretreated rice straw |
|---|---|---|---|---|---|---|
| Proximate (%wt) | Moisture | 3.4384 | 0.7253 | 0.1998 | 0.2341 | 0.2423 |
| | Volatile | 28.58 | 29.44 | 22.75 | 21.07 | 22.40 |
| | Fix carbon | 43.57 | 52.31 | 55.85 | 56.20 | 67.25 |
| | Ash | 24.41 | 17.52 | 21.19 | 22.50 | 10.11 |

From this table, it was found that the volatile content of char ranged from 21.07 to 29.44 wt.%, indicating that volatile components in the biochar had already been converted to mostly gaseous products during the pyrolysis processes. Low-temperature pyrolysis produced a higher biochar yield and enriched volatile-matter composition than the high-temperature pyrolysis while the fixed carbon content of the ash showed slightly change. The highest ash content of 22.50 % was obtained from pyrolysis at 600 ◦C. Moreover, Biochar from pyrolysis rice straw and pretreated biochar by NaOH solution were investigated the fuel properties as shown in Fig.3. The high heating value of the biochar increased from 12.16 MJ/kg in the raw materials to 19.67- 23.07 and 27.23 MJ/kg in the biochar produced at 300-600 °C and pretreated biochar at 500 °C, respectively. Consequently, this biochar should be a good raw material for co-combustion to produce the fuel gas.

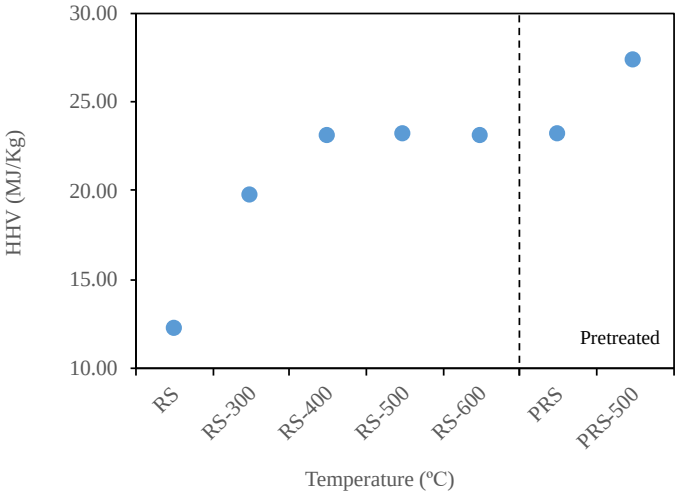


Fig.3 High heating value (HHV) of produced biochar

Characterization of the biochar composites using FTIR spectrophotometry gave spectra as reported in Fig 4. In the infrared spectra of RS, two important regions were observed (Fig. 4a), in which bands corresponding to organic functional groups above ~1100 $cm^{-1}$ are found, as well

as bands corresponding to inorganic functional groups below 1100 $cm^{-1}$. Guzmán et al. (2015) noted that the position and the type of band suggest that the inorganic functional groups are found below 1100 $cm^{-1}$, it related to the $SiO_2$ [13]. Meanwhile, the band at 3442 $cm^{-1}$ is only observed in the RS and is attributed to the vibrations of the hydroxyl groups O-H which related to the functional of $H_2O$. As the pyrolysis temperatures of RS are increased, the bands associated with the organic part begin to disappear (T > 500 °C). In the organic part, the bands shown in the spectrum in general initiate from vibrations of the aromatic part that take place in the region of 1600 – 1450 $cm^{-1}$ (bands at 1461 cm-1), and vibrations of the carbonyl group (band at 1644 $cm^{-1}$), which can be recognized to organic compounds such as cellulose and hemicellulose carbohydrates, as well as the lignin [13].

After chemical treatment, most of alkali metals were removed, and the evolution of pyrolysis products including C-H functional groups were enhanced through alkali solution. Particularly, C=O functional groups were decreased and the aromatic group were increased through NaOH leaching. Based on the previous results, the claims by Guzmán about the RS being mainly composed of hemicellulose, cellulose and lignin—by functional groups of an organic nature (aldehydes constituted by a carbonyl group and aromatic compounds)—are confirmed. It is also confirmed that these are removed in their totality at temperatures above 500 °C, in agreement with the results of the thermal analysis.

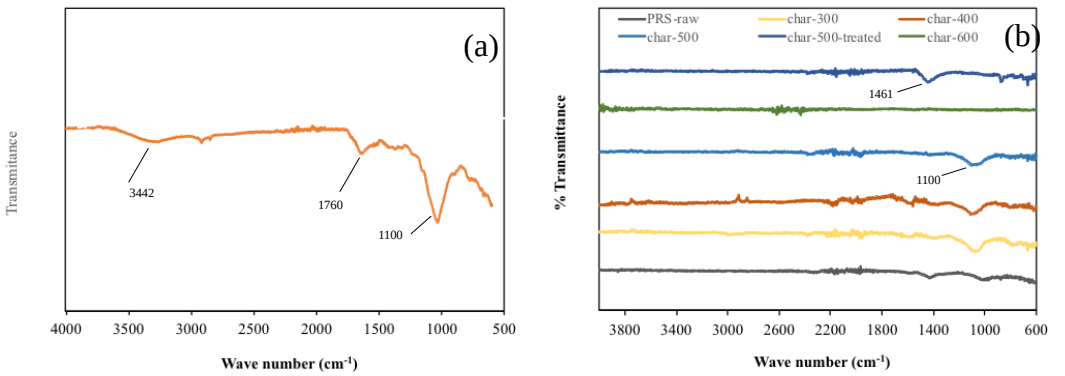


Fig. 4. FTIR spectra of the (a) rice straw (b) biochar and pretreated biochar at various temperatures

# 4. Conclusions

The most suitable RS for this purpose is that obtained at a pyrolysis temperature of 500 °C and a residence time of 2 h. Although the biochar yield from the organic fraction of rice straw was about 22.79 -28.02% wt. its energy yields were about 60% for pyrolysis above 400 °C. In comparison to the pretreated rice straw, the biochar yield of the 1M NaOH-treated increased by 46.88 % wt. at 500 °C. Proximate analysis of the biochar showed that it has high fix carbon content resulted in high heating value to 27.23 MJ/kg. The enhancement of the biochar yield was attributed to the improvement of carbonization through NaOH pretreatment. The result suggested that the pretreated rice straw has a higher reaction of carbonization and decreased the ash content. The chemical energies of solid fuels are stored in fixed carbon and volatile matter. Characterization of the biochar composites using FTIR showed the aromatic part that take place in the region of 1600 – 1450 cm-1 and the carbonyl group (band at 1644 cm-1). It can be recognized to organic compounds such as cellulose and hemicellulose carbohydrates, as well as the lignin. Moreover, the alkali metals were removed after pretreated rice straw, and the evolution of pyrolysis products including C-H functional groups were enhanced. Therefore, the pretreated biochar is suitable for the solid fuel that use for co-combustion to produce the fuel gas.

# Acknowledgments

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# （Short Communication）

# A New Biomimicry Tool for Visual Design

Ai-li Wang*

## Abstract

Designers are always looking for inspiration. Many disciplines use inspiration from nature to create something new, a practice often referred to as "biomimicry". Biology-inspired design has been widely applied and studied in engineering, architecture, products and many other disciplines (Vattam et al., 2010; Cheong et al., 2010; Fu et al., 2014; Volstad & Boks, 2012; Badarnaha, 2015; Al-obaidi, 2017), but in the field of visual design, although there are some works but seldom research. This article through the review of existing literature on biomimicry design thinking, and biomimicry interdisciplinary design development and trend of biomimicry design in the future, in order to investigate the existing biomimicry design tools whether can fit for visual designers, and provides a new tool for visual designers and students develop their creative development space.

**Keywords:** Biomimicry, Bio-Inspired Design, Designer’s Toolkit, Visual Design.

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# 1. Introduction

Biomimicry has been widely applied into engineering, architecture, products and other fields (Vattam et al., 2010; Cheong et al., 2010; Volstad & Boks, 2012; Fu et al., 2014; Badarnaha, 2015; Al-Obaidi, 2017). Generally, biologists lack knowledge of design and engineering, while engineers and designers are laymen of biology. Thus, connecting the interdisciplinary knowledge transfer, communication and creation becomes the key that should be considered in the field of biomimicry thinking (Vattam, 2008; Vattam, 2013; Cohen, 2016). In the past decade, growing efforts have been devoted to interdisciplinary research that can connect biology and other disciplines, and many biomimicry design strategies from relevant disciplines have been formulated (Bogatyreva et al., 2002; Vattam et al., 2010; Baumeister, 2012; Badarnaha, 2015). However, there is no definite research on applying biomimicry into visual design.

As for the application of biomimicry design, Benyus (1997) divided it into three levels from shallow to deep, including mimic of natural surfaces (forms), mimic of natural processes, and simulation of natural ecosystems (Belletire, 2005). Compared with other disciplines, though biomimicry design has been applied into visual design, the applications are mostly at the shallow (surface) level, and there is no profound thinking or research on the knowledge transfer between biology and visual design.

When biomimicry design methods are used into creative thinking, biomimicry design databases (AskNature, 2008) are indispensable tools for designers. So far, online searching (AskNature, 2008), interactive software (Vattam et al., 2010; Chakrabarti, 2005), biomimicry cards (Volstad, 2012; Biomimicry 3.8, 2016) and other databases have been exploited and developed, which can be used as tools in engineering, architecture, products and packing. When biomimicry design is used into different disciplines, however, the languages adopted, the views concerning design, the limitations to design issues, and the sources used to realize abstract design concepts all differ to some extent (Vattam, 2007). For instance, the focus in the field of architecture is how to use the physical space and building structures, but how to optimize functions, values, appearance and material quality in the fields of engineering and product design, and is how to optimize information transfer in the field of visual design. Thus, when designers from different disciplines use biomimicry databases, they have similarity in some areas, but also emphasize differently and use different connection languages. However, so far, there is no specific biomimicry tool for visual design.

Given the above analysis and the interdisciplinary interaction of future design (Oxman, 2016) and since biomimicry design is a promising discipline in the future (Gamage & Hyde, 2012), we find the applications of biomimicry into the vision field are superficial, but not profound or comprehensive. The problems to be solved in this study are: biomimicry design is a tool for vision designers to exploit creativity and innovation potential, but are the existing biomimicry design tools developed in the fields of engineering, architecture and product design feasible to visual design? If yes, will the tools help to enhance the novelty and profundity of visual designers? If not, what characteristics should be possessed by biomimicry design tools that are feasible to visual design?

# 2. Methodology and Steps

Here, cognitive protocol analysis was adopted, which consisted of three steps. Step 1-- test 1: no-biomimicry design experience visual designers were asked to use three ways of thinking (no-biomimicry inspired thinking, thinking assisted by biomimicry resource cards, thinking assisted by biomimicry design cases) during visual design. Step 2-- test 2: have biomimicry design experience visual designers were asked to use the three thinking ways as in step 1 during visual design. Step 3: Tests 1 and 2 were compared for discussion and analysis.

This study was aimed to explore whether the existing biomimicry design tools would help the subjects during creative conception and to explore the feasibility of these tools. Given the advances of design thinking in recent decades, Cross (1999) reorganized the existing research methods. Of them, 'oral analysis' was a complete observation of the design processes of designers (Suwa & Tversky, 1997). Oral information is the source of scientific data and the basis of studying the problem-solving process of subjects (Ericsson et al., 1980). Oral analysis is the best way to acquire oral data for studies on 'thinking aloud' in the design field (Ginsburg et al., 1983; Stewart, 1983; Finegold & Mass, 1985). The oral data reflect the process how a subject finishes the design objectives (Ericsson et al., 1980) and can be used to extract the complex structure of problem solving and to uncover the hidden internal mechanisms (Ginsburg et al., 1983). Thus, in this study, 'thinking aloud' was used as an experimental method. The whole processes were audio- and video-recorded, and photos were taken.

### 2.1 Step 1: No Biomimicry Inspired Designer

#### 2.1.1 Subjects

All subjects enrolled had sufficient experience in designing. In step 1, two no-biomimicry inspired vision designers with more than 15 years of experience in visual design were selected.

Since this study was aimed to differentiate the effects of some creative conception tools on the conception of the subjects, the test topics should be operated by the same subjects.

2.1.2 Design Topics

As for selection of topics, visual design covers graphic design, ad design, commercial design and other aspects, and graphic design is subdivided into logo design, book design and inset design. Given that none of the above different classifications can fully manifest visual design, we, after comprehensive analysis, selected poster design as the direction of test topics. This is because poster design covers many aspects of vision design, and posters are widely-accepted popular transmission ways and are aimed at information delivery.

In this study, three topics were used to test the subjects. The subjects should be the same, which avoided between-topic interference due to continuous thinking. As for topic design, topic 1 and topic 2 were parallel, but the themes were different, and topic 2 and topic 3 both involved biomimicry design and thus the directions were largely different.

Topic1: [Future] themed poster design (the subjects were encouraged to break through two-dimensionality and paper media and to use multi-sensory factors into creation, but not to use biomimicry design thinking).

Topic 2: [Environmental protection] themed poster design (in addition to the encouragement in topic 1, the subjects were provided biomimicry resource cards to help with the inspired creative conception).

Topic 3: [Break] themed poster design (in addition to the encouragement in topic 1, the subjects were provided biomimicry design cases to help with the inspired creative conceiving). Since topic 2 and topic 3 both involved the inspired creative conceiving and to avoid the interference of topic 2 on topic 3, we set them at different aspects of thinking, while ensuring both were poster design. Thus, topic 3 was an abstract concept of [break], so the subjects can comprehend it as [break through] or [break down] according to their conceptions.

2.1.3 Design Tools

Topic 1: The plotting tools (including drawing sheets, pencils, marker pens, colored pencils) and computers (as demanded by the designers) were all commonly-used by the subjects.

Topic 2: Biomimicry resource cards were also provided in addition to those in topic.

Topic 3: Biomimicry design cases were also provided in addition to those in topic 1.

2.1.4 Experimental Operation

Since the subjects should be the same person, the subjects may also be interfered by the memory from the previous topic he/she had finished, in addition to the between-topic interference. Thus, to avoid such interference from previous tests, certain intervals were set: one week between topics 1 and 2, and one month between topics 2 and 3.

Topic 1: During this no-biomimicry design, the subjects conceived topic 1 without using biomimicry design and were informed with the instruction prior to the test. During the test, the subjects creatively conceived and drafted within 30-60 minutes. The whole processes were audio- and video-recorded, and photos were taken, and the conception and drafting were photographed by digital cameras.

Topic 2: During this biomimicry design, the subjects conceived topic 2 by using biomimicry resource cards and were familiarized with the cards in advance. During the test, the subjects creatively conceived and drafted within 30-60 minutes. The whole processes were audio- and video-recorded, and the conception and drafting were photographed by digital cameras.

Topic 3: During this biomimicry design, the subjects conceived topic 3 by using biomimicry design cases and were familiarized with the cases in advance. During the test, the subjects creatively c onceived and drafted within 30-60 minutes. The whole processes were audio- and video-recorded, and the conception and drafting were photographed by digital cameras.

**2.2 Step 2: Biomimicry Inspired Designer**

2.2.1 Subjects

In step 2, the two subjects enrolled should be vision designers with experience of biomimicry design, with more than 15 years of experience in visual design, and with experience of using biomimicry design to think in the past 3 years.

2.2.2 Design Topic

The same as step 1.

2.2.3 Design Tools

The same as step 1.

2.2.4 Experimental Operation

The same as step 1.

## 3. Results and Discussions

Totally 12 groups (4 subjects × 3 topics) of data were obtained, including audio records, videos, drafts and photos. Firstly, the oral data were transcribed into literal data, which were then segmented, and finally each segmentation was encoded. During the transcription, the videos and drafts from the designing process were used, and the segmentation was based on each design idea as a unit. The segmentations were encoded according to an encoding system, and the feasibility of the biomimicry tools was discussed on basis of the results.

The results were comprehensively compared to investigate whether they can be used as effective supplementary tools by vision designers for the creative conception. If yes, we discussed how to use these tools during the design process so as to improve the novelty and depth of vision designers during the creative conception. If not, we discussed how to adjust these tools so they would become usable for vision designers.

## 4. Conclusions

The analysis of test data shows that none of the existing biomimicry tools are fully feasible for vision design, so we propose three directions or recommendations for the development of new tools. 1 Many biomimicry cases suggest biological data are very helpful for inspired designers, but the major challenge in vision design may be that the existing tools focus on the combination of biological data with engineering and structures, but rarely on the combination with vision design language. Thus, using vision language to link biology knowledge will make the tools more effective. 2 Since the biomimicry research often involves multiple disciplines, when it is used into vision design, relevant research cases will endow designers with more direct vision experience and make them more clearly inspired. Thus, more interdisciplinary cases involving biomimicry should be offered to vision designers. 3 When the existing biomimicry design tools and relevant databases are to be used by vision designers as supplementary tools in creative thinking, the biology knowledge and relevant cases should be summarized and classified using the vision design language, so that the knowledge can be effectively and rapidly used by vision designers according to their demands..

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## （Short Communication）

# Energy-Saving and Intelligent Sensing Technologies for PET Blow-Molding Machines

Uei-Ren Chen*

## Abstract

The high pressure system in the PET blow-molding machine is used to blow the PET preform to mold into a specific shape of plastic container. During a molding process, the case of broken preform will waste the gas of high pressure system. To overcome this problem, a pressure detecting system for this broken case is proposed in this research. By the way of avoiding the waste of gas, the energy can also be saved effectively. On the other hand, to get a better control of heating system in the machine, the intelligent temperature sensing method is proposed for measuring the central part of each moving preforms continuously. The practical experiment will verify the performance of our pressure detecting system and temperature sensing method for the PET blow-molding machine.

**Keywords:** Blow-Molding Machine, PET, Preform.

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# 1. Introduction

The blow molding machine [1][2], as shown in Fig. 1, is a automated machine and widely used to manufacturing the PET containers or bottles [3]. PET (Polyethylene Terephthalate) [4] is a kind of plastic materials which become pliable or moldable above a specific temperature and returns to a solid state upon cooling [5]. Preform is a semi-finished product made of PET materials by the injection molding manufacturing technique [6]. The blow-molding machine can transfer the preform into a specific shape of plastic container or bottle by way of heating and high-pressure blowing, stretching and molding processes [7][8].

The motivation of this research is twofold. To produce a high quality plastic product, blow molding machines need a high performance and great precision temperature detecting system. To save the energy of machine, we need to avoid the waste of gas in the high pressure system while preforms break.

The remainder of this paper is organized as follows. Proposed methods will be introduced in Section 2. Section 3 gives the experiment results and discussions. Finally, a brief conclusion is given in Section 4.

Fig. 1. The blow molding machine typed of EM08S1 by the KEENPRO Precision Industry Corp [9].

# 2. Proposed Methods

In this research, we proposed an intelligent temperature sensing method for continuously moving preforms, and a pressure detecting system (PDS) for the case of broken preforms in the PET blow-molding machine.

### 2.1. Architecture of Pressure Detecting System

As shown in Fig. 2, the proposed system consists of a pressure sensor for detecting the PET bottle molding area, a MCU (Micro Control Unit) of Microchip PIC processor [10] which

receives the analog signal from the sensor and controls the high-pressure blowing valve. The PLC (programmable logic controllers) of blow molding machine can communicate with the MCU through mobus protocol [11].

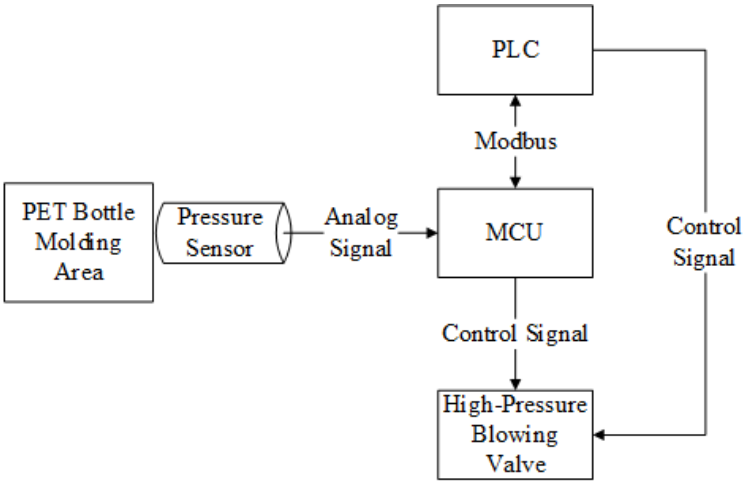


Fig. 2. Architecture of Pressure Detecting System

### 2.2. Algorithm of Detecting Broken Preforms

The procedure of detecting broken preforms can be illustrated by steps as follows.

Step 1: MCU read high pressure value Hi_P before starting detection.

Step 2: PLC starts up the process of MCU for detecting broken preform.

Step 3: MCU waits 200~250ms (adjustable parameters) and then reads the pressure value, p1, of the PET bottle molding area.

Step 4: If the difference value (Hi_P-p1)>=2kg/cm$^2$, then MCU will close the high-pressure blowing valve, else no preform breaks.

### 2.3. Intelligent Temperature Sensing Method

The MCU reads the analog signals from the infrared temperature sensor [12] [13][14], and transforms that into a digital value according to the following formula.

$$t = \frac{(adc - ADC_{min}) * (t_{max} - t_0)}{(ADC_{max} - ADC_{min})} + t_0 \quad (1)$$

Where t is the temperature value in Celsius, and the temperature range of sensor's output is from t0 to $t_{max}$(ex. 0~400˚C). In the MCU, the 10-bit digital output value of ADC (Analog to Digital Converter) is adc whose value is from $ADC_{min}$= 0000000000 to $ADC_{max}$ =1111111111 in binary format (or 0~1023 in decimal).

To detect the surface temperature of continuously moving preforms, we proposed a method which can be illustrated by the following state diagram in Fig. 3. This state diagram is implemented as a program for the MCU to execute in the sensing system.

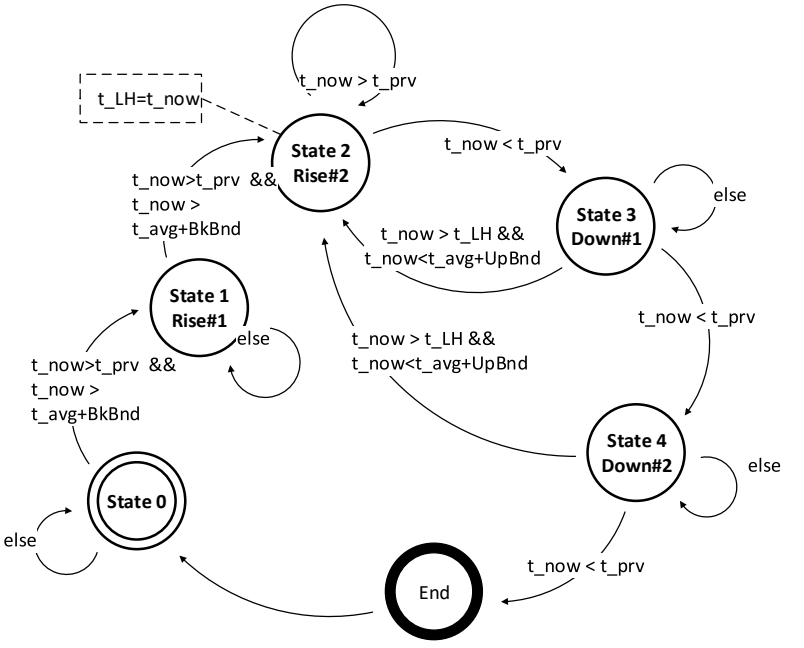


Fig. 3. The state diagram of proposed temperature sensing method

## 3. Experiment Results and Discussions

The proposed pressure detecting and temperature sensing systems has been implemented as a prototype as shown in Fig.4 and Fig.5 respectively for practical testing and verification with the PET blow molding machine.

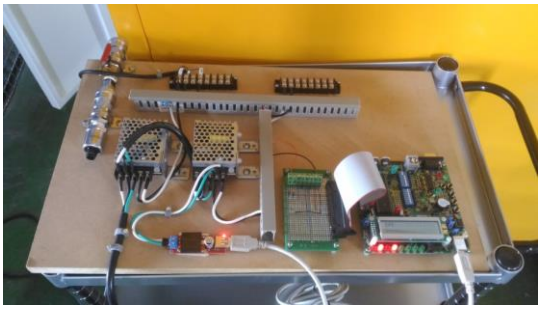

Fig. 4. The implementation of pressure detecting system

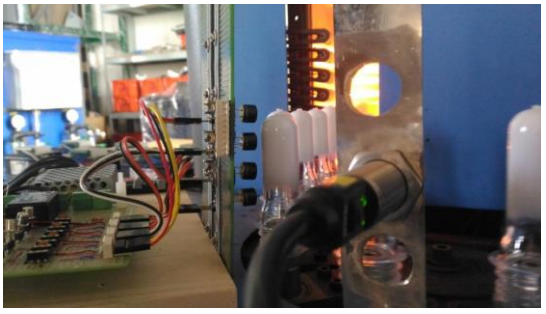

Fig. 5. The implementation of temperature sensing system for PET preforms

### 3.1. Pressure Detection Test for the Breaking Bottle Event

Fig. 6 is a pressure curve of a breaking bottle case. Assume PLC starts the MCU up at the time t0, the MCU waits 200ms and then starts to read the pressure p1 continuously of the PET bottle molding area at high pressure start point. During the time form t0+400ms to t0+600ms, a breaking bottle event occurs, and the MCU detects the difference of high pressure value and the p1 is greater than 2kg/cm$^2$, at the breaking point. The high pressure value is 28kg/cm$^2$. In this system, the conversion time for analog to digital is less than 10ms. Delay time of closing high pressure valve is about 20ms.

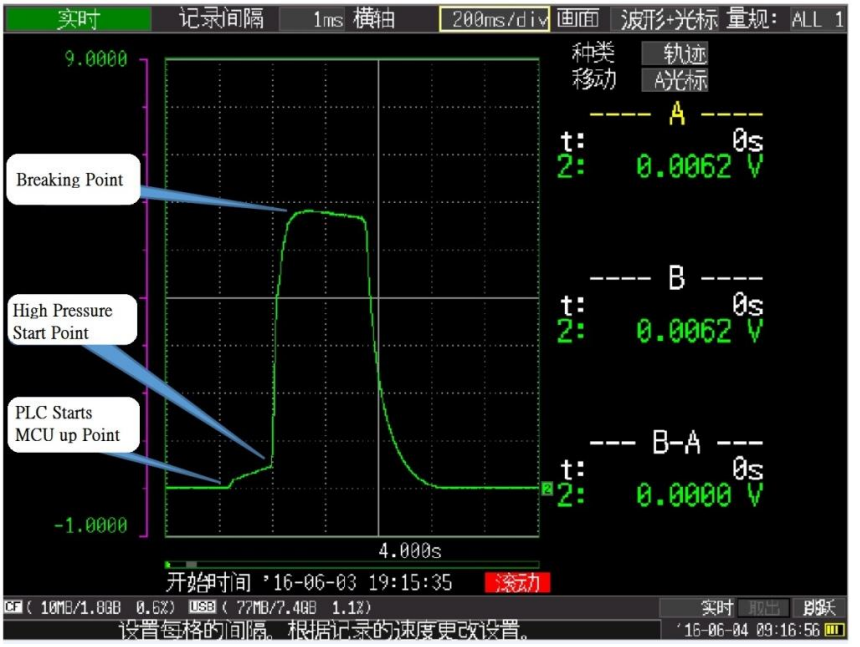


Fig. 6. The pressure curve of a breaking bottle case

### 3.2. Verification of Temperature Sensing

To verify the accuracy of temperature sensing for continuously moving preforms, as shown in Fig. 7, the t_LH is the detecting temperature of the target preform which is the local high value of the temperature curve of t_now. The result shows that the surface temperature can be detected successfully after performs pass sensing.

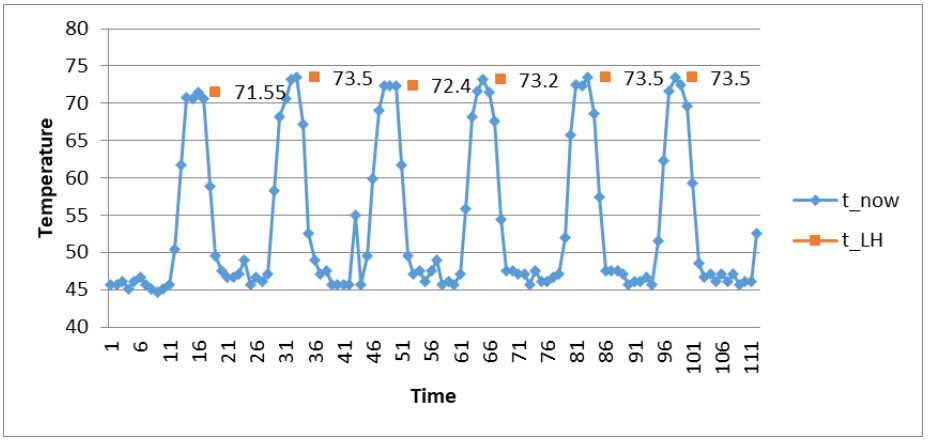


Fig. 7. The surface temperature curve and sensing of PET preforms

## 4. Conclusions

In this research, the proposed pressure detecting system can save the energy by avoiding the waste of gas while preforms broke during the blowing process. To provide a better control of heating system, proposed intelligent sensing method can detect the temperature of continuously moving preforms.

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## （Short Communication）

# Comparision of Power Consumption for Car Light System between Light Bulb and LED

Shu-Kun Guo, Si-Sin Yang*

## Abstract

The temperature inside the lamp housing after unit time can be compared between the conventional bulb and the LED bulb to determine whether the temperature resistance of the lamp housing needs to be changed after switching to the LED bulb. Compared with the traditional light bulb and the LED light bulb, the heat is compared with the light bulb and the brightness of the light flow is compared. The power consumption voltage and current comparison are completed, and the voltage and current of the conventional light bulb are measured. After the lamp system is configured, the LED bulb is energized to measure the voltage and current. Compare the above two different configuration temperature sensor *6 group six-point temperature display *1 can compare the temperature inside the lamp housing after the traditional light bulb and LED bulb is used, to determine whether the lamp needs to be changed after switching to the LED bulb Shell temperature resistance.

**Keywords:** LED, Light Bulb, Lumens.

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# 1. Introduction

With the rise of global green energy awareness and the discussion of the sustainable use of energy, the use of Light Emitting Diode (LED) has gradually gained attention. The LED is light in weight, long in life, low in pollution, and consumes power. The luminous efficiency and packaging technology of the chip are also continuously improved due to process improvement, and have been widely used in daily life. The advantages of integrated LED are 1. High luminous efficiency is higher than high pressure sodium lamp and mercury lamp 2. Long service life, 5 times higher than high pressure sodium lamp, 10 times higher than mercury lamp 3. Not easy to break 4. Adjustable light intensity 5. Low power consumption, According to different light source comparison, it can save about 50-90% of electricity. 6. Small size. Strong plasticity, can be applied in any shape. Relative LEDs also have long-term use disadvantages and limitations 1. Need heat dissipation design, not conducive to high temperature environment Used in, easy to severe light decay 2. Heat dissipation weight is large. It is not conducive to the design of light source 3. High manufacturing cost, slightly expensive, like most traditional lamps, long-term lighting, color temperature offset limit 4. Need With variable voltage drive design, the power supply life is also affected by heat. 5. If the product is worn out, it is not conducive to recycling and is not environmentally friendly.

The LEDs used in the automotive industry are mainly indicating light sources, and the external light sources are mainly taillights, directional lights, instrument panel lights, reading lights, and the like. LED headlamps are also used in automotive lighting due to their durability, fast start-up time, stable light source and energy saving. Therefore, in 2004, major automobile manufacturers have launched the concept of LED headlights. In 2007, German lighting manufacturer OSRAM also developed a special module OSTAR HEADLAMP for automotive headlights, while LEXUS and AUDI are also currently The production of 2LED headlight modules has been introduced, which indicates that LED automotive lighting has become a trend in the industry. LED headlamps must integrate LED light source, optical design, heat source management, mechanism design and circuit control to achieve maximum efficiency. Therefore, its design and cost price considerations have become one of the development priorities. This article focuses on comparing the advantages and disadvantages of LED and traditional lighting in automotive lighting and the design to be considered, to understand whether it is suitable for LEDs to be used in the current automotive industry, or to select appropriate materials for design improvement.

# 2. Theoretical analysis

Material The principle of LED bulb illumination: LED is an electronic component that emits light when it is energized. It is a light-emitting component made of semiconductor material. The principle of illumination is to convert electrical energy into light, that is, to apply current to the compound semiconductor, through the combination with the hole. The remaining energy of the analysis of the type of automobile headlights will come out in the form of light, and the life of the luminous effect will reach a life of more than 100,000 hours. The LED bulb does not need warming time, anyway, the speed is faster, the volume is smaller, and the power is saved. Low pollution. The LED lamp is a semiconductor component that is not susceptible to external shock and has a stable structure. This study explores the current energy-saving differences between LED energy-saving bulbs and conventional bulbs, and factors need to be considered in LED automotive lighting design. In the calculation of luminous efficiency of lamps, we are used to comparing LEDs with traditional light sources. We can first obtain the luminous flux (Lm) of the LED from the specifications provided by the LED manufacturer. The assumption is 144lm, the operating current (mA) is assumed to be 200mA, and the operating voltage (V) is assumed to be 12V and the thermal junction temperature (Tj). The initial luminous efficiency is obtained by dividing the luminous flux by the product of the operating current and the operating voltage: luminous flux 144 Lm / (200 mA × 12V) = 60Lm / W. The following various light sources are used in daily comparisons. It is obvious that LED lamps have obvious advantages in terms of applicable life or luminous efficiency, and environmental protection also has less impact on the environment due to the absence of mercury. However, whether the same effect is used in the vehicle must be confirmed by this research.

| Light source | LED | Power saving light bulb | Incandescent bulb |
|---|---|---|---|
| Life (hours) | 40,000 | 6,000~13,000 | 1,000 |
| Luminous efficiency (Lm/W) | 48~65.2 | 74.7~82.6 | 62.3~67.5 15 |
| With or without mercury | NO | YES | YES |

| | LED | Halogen bulb | Fisheye |
|---|---|---|---|
| advantage | 1. Can be used in different sizes for lamp holder design. 2. Can withstand high impact, | 1. The structure of the halogen bulb is very simple and the installation method is also very easy. | 1. The brightness of the fisheye is three times that of a normal halogen bulb, allowing the clear view of the day to reappear at |

| | | | |
|---|---|---|---|
| | avoiding the breakage of the bulb when a car accident occurs.<br>3. LED bulbs have a very long life span of 10,000 to 30,000 hours. | 2. Halogen bulbs have the lowest cost, and a bulb basically requires only a dozen pieces.<br>3. Halogen bulbs have even light and very good penetrating power. | night.<br>2. The life of the fish eye is not as long as the traditional tungsten wire is easily lost, and the life is up to five times longer.<br>3. Fish eyes do not burst due to soaking water or moisture. |

# 3. Experimental verification

| project | **LED** | Traditional incandescent lamp | Power saving light bulb |
|---|---|---|---|
| Service life | Extremely long （＞**50，000h**） | short （**5，000h**） | short （**3，000h**） |
| Power consumption | Very low | high | high |
| Strobe | None (DC drive) | NO | Yes (AC drive) |
| Light extraction efficiency | high （＞**90%**） | low （＜**60%**） | IN |
| Shock resistance | Good (no filament) | Poor (fragile) | Poor (fragile) |
| Environmental pollution | NO | NO | Contaminant elements such as lead and mercury |
| Maintenance cost | Very low | high | high |
| Comprehensive performance | GOOD | difference | in |

| efficacy | **LED** | Halogen bulb | Xenon lights |
|---|---|---|---|
| Power consumption voltage | 13.8V | 13.8V | 13.8V |
| Power consumption current | 2.3A | 1.4A | 8A |
| life | 100000H | 500H | 30000H |
| temperature | 84 | 218 | 360 |
| brightness | 4200K to 8000K | 2300K to 7000K | 3000K to 12000K |
| Energy saving | 2.7W | 60W | 35W |

# 4. Discussion of results

In comparison with this type of bulb, the LED bulb is a better choice for the owner than the other, which is both cheap and low-power (power saving). Other light bulbs that are more expensive or not bright enough are a big concern for safety. According to foreign research, "the traffic at night is less than one-fifth of the traffic during the day, and the traffic accidents at night are more than a quarter of the total accidents." "The death rate from traffic accidents is 3.3 times that of the daytime at night." LED bulbs enable the lights to greatly improve the safety of the roads and reduce the rate of accidents at night.

# 5. Conclusion

LED is known as the leader of next-generation lighting source because of its energy saving, environmental protection and long service life. With the continuous development and maturity of white LED technology, science is expected to replace existing ones in the next 10-20 years. Fluorescent lamps, energy-saving lamps. Countries around the world have also increased their policy support and investment in this area. China's LED industry was slowed down by the financial turmoil last year. However, under the government's active promotion of the green energy industry, LED-related applications still have considerable market potential. How to develop and integrate product characteristics for the LED industry and the car manufacturer in China is a very important issue for the future of LED headlamps. Although LED car headlights have considerable potential to replace traditional light sources and HIDs in the future, there are still quite a number of technical bottlenecks that must be overcome; they are integrated between various fields, and more traditional lighting manufacturing techniques can be met. Therefore, for the personnel who develop LED car headlights, it is necessary to master the key technologies of product design for customer demand conversion to ensure that the quality of the products can meet the needs of customers.

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# Tie Chew language use and forward attitude situation in Thailand

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## Abstract

Tie Chew is one group of Chinese dialect that their great-grandparents immigrated to Thailand during the nineteenth and early decades of the twentieth century. Although there are many Tie Chew people, we do not know about their language situation. This research presents an intergenerational comparison among speakers of the Tie Chew Chinese dialect in Bangkok regarding their language use and attitudes. The data were collected from 105 Tie Chew descent informants who selected by ages: over forty-five, twenty-five to forty-five and less than twenty-five. The instruments for collecting data were questionnaire and interview. This research found that their language use and attitude of the elder generation is the most fluent and has a good attitude toward Tie Chew. In contrast, the new generation use it less than their predecessors, and their opinion is Tie Chew language speak more difficult than Thai. Although they prefer to preserve Tie Chew as the elder generation, they agree to use Thai instead. This study will show that although there are many Tie Chew descendants in Thailand, at the present time there are a few Tie Chew speakers who speak Tie Chew language well. In addition, since Tie Chew is not a necessary thing in their everyday lives, they use Thai instead. Which ways of Tie Chew language will be happened? Either Tie Chew language is belonging to the phonology change as similarly in Standard Thai and a little Tie Chew words, or they stop using Tie Chew and shift to use Standard Thai instead.

**Keywords:** Tie Chew, Chinese Language, Chinese Dialect, Dialect In Thailand, Language Use, Language Attitude.

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# 1. Introduction

The Chinese language belongs to the Sino-Tibetan family of language. Chinese languages are divided into seven major dialects. These are Mandarin, Wu, Xiang, Gan, Hakka, Cantonese, and Min. The Min dialect group is divided roughly into two subgroups: Northern Min) and Southern Min)[1,2]. Tie Chew is a sub dialect of Southern Min dialect spoken in the western part of Guangdong. As economic reason made many Chinese from China had immigrated to the countries of Southeast Asia, including Thailand since the eighteenth century to the middle of the twentieth century. Tie Chew was one group who left their hometown and immigrated to Thailand. Therefore, there are a lot of Tie Chew people in Thailand. They are well integrated into Thai society and, in addition, a lot of Tie Chew men or women are married with Thai people and become Thai. Moreover, their descendants and young generations become more Thai. These effects will happen concern with the assimilation as Skinner[3] said "when the immigrant's descendant identifies himself in almost all social situations as Thai, speaks the Thai language habitually and with native fluency, and interacts by choice with Thai more often than with Chinese, the assimilation is considered complete". If this argument is true, it means Chinese in Thailand will be shift their language to Thai language, including Tie Chew. Although, at the present time there are a lot of Tie Chew in Thailand, it's not mean their language is still alive. This paper attempts to describe Tie Chew language use and forward attitude situation in Thailand where many Tie Chew people settled down.

# 2. Material and Methods (or Experimental)

The most of Tie Chew descendants are merchant or businessman, so Bangkok where is the capital city of Thailand and has many Tie Chew people is collected in this study. Moreover, this paper attempts to describe the situation of Tie Chew Chinese dialect in Bangkok focus on their language use and their attitude by intergenerational comparison among Tie Chew speakers. The data were collected from 105 Tie Chew descent informants who were selected by ages: group 1 age over forty-five, group2 age twenty-five to forty-five, and group3 age younger than twenty-five. The instruments for collecting data were questionnaire and interview. Then the data were analyzed by using SPSS statistical analysis program such as frequency distribution, percentage, mean, average and standard deviation.

# 3. Results of Language use, ability and attitude

According to three age groups, the data were collected from 50 males and 55 females who can be shown in table 1. Although the informants' education has various graduated, the most

informants graduated Bachelor degree (shown in table 2). Moreover, the most informants in group 1: over forty-five are trader while the most informants in group 2: twenty-five to forty-five and group 3: less than twenty-five are general hire and student respectively. The tables 1-3 are shown as follow:

**Table1**: Table of general informants' information of sex

| | Group1: Over 45 | | Group2: 25-45 | | Group3: Less than 25 | |
|---|---|---|---|---|---|---|
| | No. | % | No. | % | No. | % |
| Male | 10 | 28.57 | 19 | 54.29 | 21 | 60.00 |
| Female | 25 | 71.43 | 16 | 45.71 | 14 | 40.00 |
| Total | 35 | 100.00 | 35 | 100.00 | 35 | 100.00 |

**Table2**: Table of general informants' information of education

| | Group1: Over 45 | | Group2: 25-45 | | Group3: Less than 25 | |
|---|---|---|---|---|---|---|
| | No. | % | No. | % | No. | % |
| Did not enter the school | 3 | 8.57 | 1 | 2.86 | 0 | 0.00 |
| Primary school | 2 | 5.71 | 4 | 11.43 | 0 | 0.00 |
| Lower secondary school | 3 | 8.57 | 5 | 14.29 | 2 | 5.71 |
| High school | 2 | 5.71 | 5 | 14.29 | 10 | 28.57 |
| Bachelor degree | 19 | 54.29 | 19 | 54.29 | 23 | 65.71 |
| Others | 6 | 17.14 | 1 | 2.86 | 0 | 0.00 |

**Table3**: Table of general informants' information of occupation

| | Group1: Over 45 | | Group2: 25-45 | | Group3: Less than 25 | |
|---|---|---|---|---|---|---|
| | No. | % | No. | % | No. | % |
| Student | 0 | 0.00 | 1 | 2.86 | 35 | 100 |
| General hire | 3 | 8.57 | 14 | 40.00 | 0 | 0.00 |
| Private sector | 3 | 8.57 | 8 | 22.86 | 0 | 0.00 |
| Trader | 14 | 40.00 | 5 | 14.29 | 0 | 0.00 |
| Owner business | 4 | 11.43 | 2 | 5.71 | 0 | 0.00 |
| Work in the government service | 4 | 11.43 | 2 | 5.71 | 0 | 0.00 |
| Freelance | 4 | 11.43 | 0 | 0.00 | 0 | 0.00 |
| Housekeeper | 3 | 8.57 | 3 | 8.57 | 0 | 0.00 |

### 3.1 Language use and language ability

Their parents and their first language are very important for their language use, ability and attitude. At the beginning of this questionnaire asked about their parents and their first language. Next, the questions are about their language use and attitude which will tell the situation of their language in this present and in the future.

**Table3**: 1. Are your parents Tie Chew or Tie Chew descendant?
2. What language is your first language?

| | | Group1: Over 45 | | Group2: 25-45 | | Group3: Less than 25 | |
|---|---|---|---|---|---|---|---|
| | | No. | % | No. | % | No. | % |
| Informant's parents are | Tie Chew came from China | 12 | 34.29 | 3 | 8.57 | 0 | 0.00 |
| | Tie Chew descendant | 23 | 65.71 | 32 | 91.43 | 35 | 100 |
| Informant's first language | Tie Chew | 5 | 14.28 | 0 | 0.00 | 0 | 0.00 |
| | Thai | 27 | 77.14 | 34 | 97.14 | 35 | 100.00 |
| | Mandarin | 2 | 5.71 | 1 | 2.86 | 0 | 0.00 |
| | Others | 1 | 2.86 | 0.00 | 0.00 | 0 | 0.00 |

The table 1, question 1 and 2 shows the most of informants of all groups speak Thai as their mother tongue. Although all of them are Tie Chew descendants, the informants aged over forty-five have 5 people or 14.28 % who still speak Tie Chew as their mother tongue and some of them speak Mandarin and others. On the other hand, 34 people or 97.14% of the informants aged twenty-five to forty-five speak Thai and just only 1 person speak Mandarin as their mother tongue. Moreover, all of informants aged less than twenty-five speak Thai.

**Table4**: 3. Who did you start speaking Tie Chew?

| Language | Group1:over 45 | | Group2:25-45 | | Group3:Less than 25 | |
|---|---|---|---|---|---|---|
| | No. | % | No. | % | No. | % |
| Grand Parents | 0 | 0.00 | 1 | 2.86 | 3 | 8.57 |
| Parents | 17 | 48.57 | 2 | 5.71 | 1 | 2.86 |
| Teachers | 1 | 2.86 | 0 | 0.00 | 2 | 5.71 |
| Relatives | 4 | 11.43 | 0 | 0.00 | 3 | 8.57 |
| No answer | 13 | 37.14 | 32 | 91.43 | 26 | 74.29 |

It is about 62.86% of the informants aged over forty-five spoke Tie Chew language with others especially their parents (48.57%). By the contrast, a few informants aged twenty-five to forty-five (about 11%) use Tie Chew with their parents and grandparents. However, this research surprisingly finds that 9 people or 25.71% of informants aged less than twenty-five spoke Tie Chew more than the informants aged twenty-five to forty-five. Although the numbers of informants aged less than twenty-five use Tie Chew more than the numbers of informants aged twenty-five to forty-five, the most of the informants aged less than twenty-five spoke with are grandparents and relative which is not the same as the most informants aged over forty-five and aged twenty-five to forty-five who use Tie Chew with their parents.

**Table5**: 4. Who did you speak Tie Chew with when you were child?

| Language | Group1: over 45 | | Group2: 25-45 | | Group3: Less than 25 | |
|---|---|---|---|---|---|---|
| | No. | % | No. | % | No. | % |
| Grand Parents | 0 | 0 | 1 | 2.86 | 3 | 8.57 |
| Parents | 19 | 54.29 | 0 | 0 | 5 | 14.28 |
| Relatives | 2 | 5.71 | 2 | 5.71 | 0 | 0 |
| No answer | 14 | 40.00 | 32 | 91.43 | 27 | 77.14 |

The informants about 54.29% who aged over forty-five spoke Tie Chew with their parents while the informants aged twenty-five to forty-five and less than twenty-five (91.43% and 77.14% respectively) do not have the answer. Just only 8.57% of the informants aged twenty-five to forty-five with their relatives (5.71%) and grandparents (2.86%), while about 22.85% of the informants in group 3 spoke with their parents (14.28%) and grandparents (8.57%).

**Table6**: 5. Who do you speak Tie Chew with…..?

| Language | Group1: over 45 | | Group2: 25-45 | | Group3: Less than 25 | |
|---|---|---|---|---|---|---|
| | No. | % | No. | % | No. | % |
| Grand Parents | 0 | 0 | 1 | 2.86 | 4 | 11.43 |
| Parents | 3 | 8.57 | 0 | 0 | 4 | 11.43 |
| Sisters and/or brothers | 5 | 14.29 | 0 | 0 | 0 | 0 |
| Their child or children | 1 | 2.86 | 2 | 5.71 | 0 | 0 |
| Relatives | 7 | 20.00 | 0 | 0 | 1 | 2.86 |
| No answer | 19 | 54.29 | 32 | 91.43 | 26 | 74.29 |

From table 6 shows that Tie Chew descendants aged over forty-five speak Tie Chew with relatives and sister and/or brother at 7% and 5% respectively. For the informants aged twenty-five to forty-five speak Tie Chew with their children and their grandparents at 2% and 1% while the informants aged less than twenty-five speak with their parents and their grandparents at 4% and 4% respectively.

**Table7**: 6. Do you understand when your parents talk with each other by using Tie Chew language?

| Language | Group1: over 45 | | Group2: 25-45 | | Group3: Less than 25 | |
|---|---|---|---|---|---|---|
| | No. | % | No. | % | No. | % |
| Understand | 19 | 54.29 | 2 | 5.71 | 2 | 5.71 |
| Do not understand | 15 | 42.86 | 31 | 88.57 | 32 | 91.43 |
| No comment | 1 | 2.86 | 2 | 5.71 | 1 | 2.86 |

The table 7 shows that the most of informants do not understand Tie Chew language that their parents talk with each other by using Tie Chew language. However, it is not surprisingly that 54.29 % of the informants aged over forty-five understand Tie Chew that their parents talk

with each other while 15% of them do not understand. On the other hand, the most informants about 88.57% and 91.43% aged twenty-five to forty-five and less than twenty-five respectively do not understand.

**Table8**: 7. Can you speak Tie Chew well?

| | Group1: over 45 | | Group2: 25-45 | | Group3: Less than 25 | |
|---|---|---|---|---|---|---|
| | No. | % | No. | % | No. | % |
| excellent | 3 | 8.57 | 1 | 2.86 | 0 | 0.00 |
| good | 11 | 31.43 | 1 | 2.86 | 0 | 0.00 |
| fair | 6 | 17.14 | 0 | 0.00 | 5 | 14.29 |
| poor | 15 | 42.86 | 30 | 85.71 | 29 | 82.86 |
| No comment | 0 | 0.00 | 3 | 8.57 | 1 | 2.86 |

The question in table 7 shows that almost all informants aged over forty-five can speak Tie Chew, although they speak it poorly. For the informants more than 80% who aged twenty-five to forty-five and less than twenty-five speak it poorly. As you can see, the informants aged over forty-five speak Tie Chew excellently, well, and fairly at 8.57%, 31.43% and 17.14% respectively. On the other hand, the same numbers or about 2.86% of informants aged twenty-five to forty-five speak Tie Chew excellently and well while the informants about 14.29% aged less than twenty-five speak it fairly.

**Table9**: 8. Which language do you speak excellently at the present time?

| Language | Group1: over 45 | | Group2: 25-45 | | Group3: Less than 25 | |
|---|---|---|---|---|---|---|
| | No. | % | No. | % | No. | % |
| Tie Chew | 7 | 20.00 | 2 | 5.71 | 0 | 0.00 |
| Thai | 28 | 80.00 | 33 | 94.29 | 35 | 100 |

This question focuses on the language which the informants speak excellently. The results are; some informants aged over forty-five and twenty-five to forty-five speak Tie Chew and most of them speak Thai. In the other hand, all of informants aged less than forty-five speak Thai.

**Table10**: The table shows their Tie Chew language ability

| **No.** | **Questions** | **Group1: over 45** | | | | **Group2: 25-45** | | | | **Group3: Less than 25** | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | **Yes** | | **No** | | **Yes** | | **No** | | **Yes** | | **No** | |
| | | No. | % | No. | % | No. | % | No. | % | No. | % | No. | % |
| 9 | Tell the direction | 18 | 51.43 | 17 | 48.57 | 3 | 8.57 | 32 | 91.43 | 2 | 5.71 | 33 | 94.29 |
| 10 | Ask and tell the time | 21 | 60.00 | 14 | 40.00 | 3 | 8.57 | 32 | 91.43 | 4 | 11.43 | 31 | 88.57 |
| 11 | Tell your biography | 14 | 40.00 | 21 | 60.00 | 3 | 8.57 | 32 | 91.43 | 2 | 5.71 | 33 | 94.29 |
| 12 | Describe and order about | 15 | 42.86 | 20 | 57.14 | 3 | 8.57 | 32 | 91.43 | 1 | 2.86 | 34 | 97.14 |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | your job | | | | | | | | | | | | |
| 13 | Describe the people in your family | 19 | 54.29 | 16 | 45.71 | 3 | 8.57a | 32 | 91.43 | 3 | 8.57 | 32 | 91.43 |
| 14 | tell the climate | 21 | 60.00 | 14 | 40.00 | 4 | 11.43 | 31 | 88.57 | 3 | 8.57 | 32 | 91.43 |
| 15 | Speak Tie Chew automatically | 15 | 42.86 | 20 | 57.14 | 3 | 8.57 | 32 | 91.43 | 2 | 5.71 | 33 | 94.29 |
| 16 | Denies someone asking | 17 | 48.57 | 18 | 51.43 | 5 | 14.29 | 30 | 85.71 | 3 | 8.57 | 32 | 91.43 |
| 17 | Understand the telling about averting a catastrophe by magic power | 18 | 51.43 | 17 | 48.57 | 4 | 11.43 | 31 | 88.57 | 2 | 5.71 | 33 | 94.29 |
| 18 | Respond someone quarrel you | 13 | 37.14 | 22 | 62.86 | 3 | 8.57 | 32 | 91.43 | 1 | 2.86 | 34 | 97.14 |
| 19 | Discuss any topics | 15 | 42.86 | 20 | 57.14 | 4 | 11.43 | 31 | 88.57 | 2 | 5.71 | 33 | 94.29 |
| 20 | Communicate in general topics (Food, small talk and etc.) with people in your family? | 19 | 54.29 | 16 | 45.71 | 4 | 11.43 | 31 | 88.57 | 2 | 5.71 | 33 | 94.29 |
| 21 | Tell your best wishing in your life | 15 | 42.86 | 20 | 57.14 | 4 | 11.43 | 31 | 88.57 | 2 | 5.71 | 33 | 94.29 |

Table 10 shows their Tie Chew language ability which the most of informants aged over forty-five can speak Tie Chew in every topics. In the other hand, some of the informants aged twenty-five to forty-five and a little bit of the informants aged less than twenty-five can speak every topics.

**Table11**: 22. Which language do you prefer to speak the most?

| | Group1: over 45 | | Group2: 25-45 | | Group3: Less than 25 | |
|---|---|---|---|---|---|---|
| | No. | % | No. | % | No. | % |
| Thai | 29 | 82.86 | 33 | 94.29 | 32 | 91.43 |
| Tie Chew | 5 | 14.29 | 1 | 2.86 | 0 | 0.00 |
| English | 1 | 2.86 | 0 | 0.00 | 3 | 8.67 |
| No comment | 0 | 0.00 | 1 | 2.86 | 0 | 0.00 |

Table 11 shows which language that the informants prefer to speak. Although 5 people or 13.9% of the informants aged over forty-five prefer to speak Tie Chew and 3 people or 8.67%

of the informants aged less than twenty-five prefer to speak English, the most informants of three groups prefer to speak the most is Thai.

### 3.2 Language attitude

This part shows their attitude toward Tie Chew language by using eleven questions below;

**Table12**: 23. Which language do you think it is useful for you?

| | Group1: over 45 | | Group2: 25-45 | | Group3: Less than 25 | |
|---|---|---|---|---|---|---|
| | No. | % | No. | % | No. | % |
| Tie Chew | 1 | 2.86 | 0 | 0.00 | 0 | 0.00 |
| Thai | 23 | 65.71 | 27 | 77.14 | 16 | 45.71 |
| Mandarin | 6 | 17.14 | 4 | 11.43 | 8 | 22.86 |
| English | 5 | 14.29 | 4 | 11.43 | 11 | 34.43 |

Table 12 shows the attitude toward the language that Tie Chew descendants think it is useful for them. The result on the table shows they think Thai language is the first one for them, then are Mandarin and English while Tie Chew is the last one- there is one informant aged over forty-five think Tie Chew is more useful.

**Table13**: 24. Which language do you think it is very important for you?

| | Group1: over 45 | | Group2: 25-45 | | Group3: Less than 25 | |
|---|---|---|---|---|---|---|
| | No. | % | No. | % | No. | % |
| Thai | 26 | 74.29 | 28 | 80.00 | 20 | 87.14 |
| Mandarin | 3 | 8.57 | 4 | 11.43 | 8 | 22.86 |
| English | 6 | 17.14 | 3 | 8.57 | 7 | 20.00 |

Table 13 shows the attitude toward the language that Tie Chew descendants think it is very important for them. The result on the table shows they think Thai language is the first important for them, then they are Mandarin and English. Surprisingly that nobody thinks Tie Chew is very important for them.

**Table14**: 25. Which language do you think it will be very important for your children?

| | Group1: over 45 | | Group2: 25-45 | | Group3: Less than 25 | |
|---|---|---|---|---|---|---|
| | No. | % | No. | % | No. | % |
| Tie Chew | 1 | 2.86 | 0 | 0.00 | 2 | 5.71 |
| Thai | 8 | 22.86 | 25 | 71.43 | 17 | 48.57 |
| Mandarin | 17 | 48.57 | 6 | 17.14 | 4 | 11.42 |
| English | 9 | 25.71 | 4 | 11.43 | 12 | 34.28 |

Table 14 shows which language does the informants think it will be very important for your children. The result from the table shows the informants aged over forty-five think that Mandarin is very important for their children. On the other hand, the informants aged

twenty-five to forty five and aged less than twenty-five think Thai language is very important for their children. For Tie Chew language, just only 2.86% and 5.71% of the informants aged over forty-five and less than twenty-five respectively think it will be very important language for their children.

**Table15:** Tie Chew descendants' attitude toward their language

| No. | Questions | Group1: over 45 (%) | | | Group2: 25-45 (%) | | | Group3: Less than 25 (%) | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Yes | No | Not Sure | Yes | No | Not Sure | Yes | No | Not Sure |
| 26. | In case of somebody can speak Thai and/or Mandarin, do you think it is more important than those can speak Tie Chew? | 68.60 | 5.80 | 25.70 | 54.30 | 20.00 | 25.70 | 54.30 | 17.10 | 28.60 |
| 27. | Do you think Tie Chew language can help you to apply the job or promote? | 40.00 | 5.80 | 54.30 | 31.50 | 25.70 | 42.90 | 40.00 | 22.80 | 37.10 |
| 28. | If you would like to preserve Tie Chew, you think you should use only Tie Chew in your family? | 25.70 | 28.60 | 45.70 | 45.70 | 22.90 | 31.40 | 34.30 | 31.40 | 34.30 |
| 29. | Do you think the government should support Tie Chew language in school or any ways to preserve it? | 71.50 | 5.70 | 22.90 | 34.30 | 17.20 | 28.60 | 45.70 | 17.20 | 37.10 |
| 30. | If the less to speak Tie Chew, the less to be Tie Chew descendants. | 68.60 | 14.30 | 17.10 | 51.40 | 20.00 | 28.60 | 45.70 | 28.50 | 25.70 |
| 31. | Do you think speaking Tie Chew is difficult and should to shift to speak Thai? | 20.00 | 45.70 | 34.30 | 54.30 | 20.00 | 25.70 | 45.70 | 14.30 | 40.00 |
| 32. | Do you think Tie Chew language will be loss in the future? | 51.40 | 17.10 | 31.40 | 51.50 | 22.80 | 25.70 | 37.10 | 22.90 | 40.00 |
| 33. | Are you sad if you new generations cannot speak Tie Chew? | 80.00 | 2.90 | 17.10 | 51.40 | 20.00 | 28.60 | 40.00 | 31.40 | 28.60 |

The questions 26-33 show; although, the most of informants agree with Tie Chew language will be loss in the future, they would like to preserve it. 45.70% and 34.30% which is the most of informants aged twenty-five to forty-five and age less than twenty-five respectively would like to preserve Tie Chew by using it in their house. For this question, it make me amazingly that the most of informants aged over forty-five do not sure, and the less of them would like to preserve it. On the contrary, the most of informants aged over forty-five think that the government should support Tie Chew language in school or other ways to preserve it, and they disagree with speaking Tie Chew is difficult. Moreover, we are not surprised that the most of them are sad if their new generation cannot speak Tie Chew. Although, the most of informants aged twenty-five to forty-five and the informants aged less than twenty-five agree with speaking Tie Chew is more difficult than Thai, the most of them are sad if their new generation cannot speak Tie Chew.

However, from the above shown that the most of Tie Chew descendants in Thailand realized to preserve Tie Chew language and regretted about their descendants cannot speak Tie Chew, they though that Tie Chew is less important than other language; Thai, Mandarin and English. Moreover, they thought that Thai will be very important for their children (see table14). This point implies that the new generation might not to learn or speak Tie Chew. Although the most of informants were sad that their new generation cannot speak Tie Chew, they are going to shift their language to Thai.

## 4. Conclusions

As Chinese people settled down in Thailand many years ago, so the first another language which was the most important for their life is Thai. In addition, Thai policy would like to assimilate everybody in Thailand to be Thai, so the official language and the language in school was Thai. These are major causes of Tie Chew people use Thai language more than Tie Chew. These factors impact to Tie Chew language and attitude. Although, there are many Tie Chew people in Thailand, at the present time there are a few Tie Chew speakers who speak Tie Chew language well. In other words, Tie Chew speakers aged over forty-five years who can speak Tie Chew, but those under forty-five years can speak only a little Tie Chew at home. In addition, their children learn Thai in school and cannot speak Tie Chew. From this study found that some informants aged over forty-five still use Tie Chew language, but they use only with their elder and same generation cousins and relatives. On the other hand, they use Thai with their new generation and the other who are not Tie Chew. For the informants aged twenty-five to forty-five, a few of them still use Tie Chew, but they used it less than the informants aged less than twenty-five. Although, the most of all informants would like to preserve Tie Chew by using only Tie Chew in their families, the most of informants aged over forty-five were not sure while their opinion toward Tie Chew language is not difficult. Moreover, they preferred the government support Tie Chew language in school or any ways to preserve it which this opinion is cover the all of informants. For the informants aged twenty-five to forty-five, although the most of them would like to preserve Tie Chew, agree with able to use Tie Chew helping them for applying or promoting their occupation, and regret about their new generations cannot speak Tie Chew, they thought that Thai or Mandarin or English language is more important than Tie Chew as same as the other groups. In addition, the most informants would like their children to speak Thai. This point is likely a sign to explain that in the theory they would like to preserve but in practice, they would like to shift their language to Thai. Since it is not a necessary thing in their everyday lives, they use Thai language instead.

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# Exploration of Contemporary Thinking in Calligraphy Teaching

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## Abstract

Sustainable life is of vital importance not only in our modern society but also in the field of education. Nowadays, the notion of sustainability has been defined and applied in a multifarious manner. Similarly, a wide variety of pedagogic approaches or patterns can be re-interpreted based on universal values and concepts so that they would be more acceptable to learners of the latest generations. In the digital age, in particular, classical arts education should keep abreast of the novel notions such as those of sustainable life with a view to satisfying the needs of the present-day learners. Accordingly, classical arts education can provide learners with intrinsic motivations and enhance the quality of their personal life regardless of where they live. Thus, the power of education knows no bounds.

The current study attempted to investigate and analyze the teaching approaches of innovative calligraphy instructors via qualitative research and in-depth interviews. And aims to re-evaluate the stereotypical notions regarding the instructional patterns of traditional arts education. It can be expected that, if fortified with novel ideas and teaching materials, traditional arts education will help learners enhance their personal competence in artistic appreciation as well as function as a medium to plant the seeds of intrinsic interest in cultural creative industry in the mind of learners.

**Keywords:** Calligraphy, Calligraphy Teaching, Sustainable Life, Cultural Creative Industry.

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# 1. Introduction

Classical art education should be inherited in line with the needs of the times. Adaptability, aesthetic economy, sustainable life, and service innovation are all indicative contemporary needs and thinking. Calligraphy, a traditional form of art in Chinese culture, is representative of both ethnic qualities and cultural images. These days, nevertheless, not only the number but also the leaning motives of Calligraphy learners has been on the decline, which can be regarded as a consequential phenomenon now that, as a means of communication, handwriting has been losing ground to typing at an alarming pace.

Consequentially, younger generations of Chinese people understand far less about the shape, sound, meaning and the connotation of each Chinese character. Also, many calligraphy instructors choose to stick with conventional teaching practices and thus give instruction of closure property and monotony. Hence, it does matter how a calligraphy instructor can provide effective teaching practices which can bridge the gaps between generations. In that case, this valuable cultural heritage, calligraphy can be passed down smoothly. Accordingly, the current study aimed to explore the translation of theories and practices of Contemporary needs and thinking into the execution of classical arts education in the digital age and the strategies to summon up both instructors' enthusiasm and learners' inner motivation.

# 2. Methods

This article is based on literature analysis and case interviews first. Through the literature analysis method to understand the thinking and practice of contemporary Taiwanese calligraphy education, supplemented by case interviews to understand how calligraphy teaching combines the use of calligraphy media in the concept of sustainable life. At the same time, this study also selected six contemporary senior calligraphy teachers according to qualitative research and in-depth interviews to understand their connotation of calligraphy teaching under contemporary thinking, in order to analyze the various aspects of contemporary calligraphy teaching.

### 2.1 1The application of literature analysis method in this study

In this study, the literature analysis method is mainly to understand the new thinking of contemporary calligraphy education in Taiwan, including the new practice of creation, the education concept of people-oriented (adaptability), the educational application of cultural and creative industries in the aesthetic economic era, and the digital Integrate topics such as the current state of teaching.

### 2.2 The application of case interview method in this study

Reflecting on one's inner and outer living environment is two important themes of contemporary education. In addition to adaptability, sustainable life is also an important reflection of contemporary art education. This study selected Taiwan's prestigious traditional paper mill "Guangxing Paper" as the object of the case interview method, and discussed how traditional industries can develop and produce calligraphy paper remanufactured with agricultural waste in response to the concept of "sustainable life". Provide ink painting and calligraphy creation and teaching.

### 2.3 The application of in-depth interviews method in this study

Six calligraphy instructors were chosen as subjects for 60 minute-long face-to face interviews carried out in their calligraphy classroom.The questions raised in the interviews were mainly focused on the application of concepts of contemporary innovation to calligraphy instruction. The conclusions were later drawn from the thematic analyses based on the dialogues between the researcher and the interviewees.

**Table 1.** Subjects' background

| Subject | Age | Experience in calligraphy teaching | Experience in innovative instruction | Job title | Expertise |
|---|---|---|---|---|---|
| A | 70 | 36 years | 21 years (adaptability, tailor-made, sensibility experiences and integrating digital elements into the pedagogical teaching) | Elementary and junior high school, university, community, calligraphy teacher | Calligraphy |
| B | 66 | 30 years | 19 years (tailor-made and sensibility experiences instruction) | Elementary and junior high school, university, community, calligraphy teacher | Calligraphy |
| C | 53 | 25 years | 18 years (sensibility experiences and integrating digital elements into the pedagogical teaching, Sustainable life | Elementary and junior high school, community, calligraphy teacher | Calligraphy |

| | | | | | |
|---|---|---|---|---|---|
| | | | concept) | | |
| D | 51 | 20 years | 19 years (adaptability, tailor-made, sensibility experiences and integrating digital elements into the pedagogical teaching, Sustainable life concept) | Universities, community calligraphy ink and wash painting teachers | Calligraphy |
| E | 49 | 18 years | 17years (adaptability, tailor-made, sensibility experiences and integrating digital elements into the pedagogical teaching, Sustainable life concept) | Elementary, middle school, community calligraphy ink and wash painting teacher | Calligraphy Ink paint |
| F | 51 | 26 years | 19 years (adaptability, tailor-made, sensibility experiences and integrating digital elements into the pedagogical teaching, Sustainable life concept) | Junior high school, community calligraphy ink and wash painting teachers | Calligraphy Ink paint |

# 3. Results and Discussions

## A. Service innovation/The Adaptability and Sensibility Experience of Calligraphy Education

Through literature analysis, we can understand that in the definition of this generation of education, " adaptability " is the main idea, and " adaptability " is " tailor-made ", Presumably, innovative ideas is also applicable to arts education, which will not only enhance an instructor’s manners of service and instructional accountability but also satisfy a learner’s aesthetic perceptions and demands for professional skills（Chi-Hsiung Chen, Ting-Jie Wang 2018）

First of all, in the adaptive and customized teaching method of calligraphy, we understand that one-way pedagogic teaching method still prevails among calligraphy instructors in Taiwan. However, if adjusted in accordance with the notion of adaptability, such a teaching model grows out of the humanistic approach to teaching and encourages learners to follow a self-actualizing pattern of learning calligraphy. Hence, learners can be guided to discover the writing form of calligraphy which best suits their personality.An adaptability-oriented teaching model itself is custom-made service.

Furthermore, if calligraphy learners are guided to familiarize themselves with immersion in an instructor's "adaptability teaching method, they can derive not only inspiration but also aspiration from the learning process. Thus, learners can gain deeper insights into the aesthetic nature of calligraphy.

Esthetician Jiang Xun thinks that: "the basic strokes of calligraphy can be learned through natural images, allowing learners to connect calligraphy with nature and the beauty of life." Jiang Xun also believes that in the writing of Chinese characters, it involves the long "rules" of life. "Students learn straight lines and learn the curves; learners are correct and learn to be inclusive. The core values of Oriental Asian culture have always been in the writing of Chinese characters." (Jiang Xun, 2009) Furthermore, in terms of the sensibility experience of calligraphy education, experiential learning help learners gain a greater sense of achievement. In order to provide learners with the emotional quality time, an instructor needs to create a learning process in which learners are encouraged or guided to perceive joyful feelings evoked by the classroom circumstances and instructor-learner interaction, which are referred to as sensibility experiences. In the model of service innovation, there are three types of sensibility experiences: the sensibility environment, the sensibility experience and sensibility products. Among them, the sensibility experience offers a great chance for calligraphy instructor to create quality time for teacher-student interaction. "Sensibility experience refers to a successful process or activity in which consumers can recall familiar life experiences or create vivid memories." (Rung-Tao Lin, 2011) Accordingly, when immersed in a learning environment where sensibility experiences are readily available, learners are more likely to produce creative works of art which take on characteristics of sensibility experience, which not only elevates learners' satisfaction in learning but also unlock their potential for more cultural and creative output.

**B. Integrating digital elements into the Calligraphy pedagogical model**

In today's various life orientations, digitalization is inevitable. It is an important teaching

mode that we should pay attention to and even use. Classical arts instruction, if combined with digitalized teaching methods, can be upgraded further in terms of the quality of both teaching and learning.

Traditional calligraphy teaching has its own positive effects, but it still leaves some things to be desired. If instructors can integrate information technology into their calligraphy teaching, they can offer more colorful and vivid sensuous materials and thus provide students with an immersive sensory experience, which helps make up for their lack of real-life experience because they are directed to observe, understand, contemplate and produce. Digital technology helps make teachers more effective in preparing materials for their own instruction. (Xiy-uan Wang, 2006) Accordingly, technology-aided calligraphy instruction can be expected to bring about rich and profound effects. For instance, technology helps overcome the limitations of time and space and thus makes long-distance teaching possible.

**C. The application of sustainable life concept in calligraphy teaching media**

For classical art such as calligraphy and ink painting, the concept of sustainable life can be applied to teaching media. There are many new generations of calligraphy and ink painting educators who have brought the concept of sustainable life into their teaching, such as reducing paper use, creating art on stone or on discarded wood. This study uses in-depth interviews to understand the practices of paper mills that are consistent with the concept of sustainable life.

The paper industry, the technology brought by the Japanese era, has a good foundation in Puli. Papermaking culture has a history of seventy years in Taiwan, but in the era of mechanized technology, traditional handmade paper has slowly withered. However, in Puli Town, Mr. Huang Huanzhang, who still insists on hand-made papermaking, continues to work hard on the cultural heritage of handmade paper in a difficult environment. Huan-zhang Huang and his wife transformed Cuansing Paper mill into a sightseeing factory, and then successively set up the first paper industry culture museum, Taiwanese handmade paper shop, etc., using different planting fibers to create distinctive paper creations.

Huan-zhang Huang and his wife are very concerned about the issue of tight global warming resources and hope to create more cultural and creative products with discarded crops. Shu-li Wu, the wife of Chairman of Cuansing Paper mill, said: "In the past, people thought that papermaking is the idea of cutting trees. This kind of thinking has always made us feel awkward. If we waste a lot of crops, we will try to make paper and complete one. Useful paper. This is a small expression of our mind for us humans, even for the whole earth." With the concept of gene bank, we use the bamboo shoots of Puli’s local white bamboo shoots, and The

betel nut trunk and the fiber of the banana tree make full use of local agricultural waste to make a variety of special papers.

In 2009, Huan-zhang Huang and his wife responded to the cultural and creative activities advocated by the Cultural Construction Committee. In just two years, a hundred plant material papers were developed and planted fibers in these gene banks were developed. His raw materials not only have the value of environmental protection and record, but also become the application materials of cultural and creative products. Huan-zhang Huang and his wife have upgraded the traditional hand-made paper industry to a refined level, striving to continue to do their best in environmental protection, and to enable the increasingly declining manual paper industry to rediscover the power of new life. More importantly, through such efforts, the concept of sustainable life has also been brought into the creation and teaching of contemporary calligraphy and ink painting (Huan-zhang Huang, Shu-li Wu 2018)

### 3.4 Data analysis of in-depth interviews

A comprehensive analysis on the oral data collected from the interviews was carried out and findings of the current study are as follows：

1. Most of the interviewees, regardless of their age, have previous experiences of putting tailor-made adaptability instruction into practice and hold that learners should be granted the freedom to pick and choose the calligraphy writing form that they individually favor, which in turn will benefit their learning. Adaptability instruction, accordingly, will turn a short-term learning experience into a lifelong pursuit of interest.

   Among the interviewees, Subject A seemed to look at calligraphy instruction from a relatively comprehensive viewpoint. He holds that adaptive teaching is indeed necessary, especially for learners at the beginner level. When a learner has reached the intermediate level, it is necessary to lead him or her to step out of their comfort zone so that they have the opportunity to develop a more distinctive writing style.
2. As for sensibility experience, it was found that sensibility experience is a more commonly used innovative teaching model for calligraphy instructors. Most of the interviewees display professional books and calligraphy artworks in their studios or classrooms. allowing learners to enter the study field and feel the grace and elegance of classical calligraphy. “Subjects A, D, E, F” individually developed several “touching experience” practices based on the progress of their studies, so that students could arouse feelings of emotion caused by the creation of classical art-linked texts. Achievements and willingness to learn. “subjects D, E, F” mostly used calligraphy on lanterns, screens, bookmarks, stone and fans. Looking at the

above example. The content of the “touching experience” brought by the calligraphy learners after each stage of learning not only brings a meaningful cultural and creative experience to the learners of calligraphy, but also produces many creative writings that agree with the “Sensitive goods”.

3. According to the post-interview observations, the introduction and presentation of the course content by digital media is the most extensive. At present, the content of calligraphy teaching is taught by PowerPoint, and it is almost completely used.And teachers can effectively produce multi-professional teaching materials through online media. “subject A” said: “I have long since produced a calligraphy teaching professional website, not only my own calligraphy profession, but also integrated calligraphy teaching. “Subjects A, B, D” currently have personal teaching pages produced, and the remaining interviewers also have the participation and application of group, academic or educational web pages. At the same times“subjects A, B, D, and E” have synchronous demonstration video at the time of speech or teaching. As far as distance education is concerned, there are also successful examples of innovation. “Subject A” said: “In response to students' needs, we have been teaching distance education for more than a decade, and we have successfully conducted distance education from Taiwan to cities and counties.” Lastly, the high degree of development of the Internet community has also become an important function of teaching services. Many art groups use the online community to plan, operate, and display learning outcomes. In addition, “subjects A, E, and F” all use Facebook, Line, and other communities to teach and correct student work. The five interviewees all agreed to bring the concept of Sustainable life into calligraphy teaching and creation, and the actual implementation of the teaching is about 50 years old.

In summary, a Contemporary calligraphy teaching mode teaching model is shown in Figure 1:

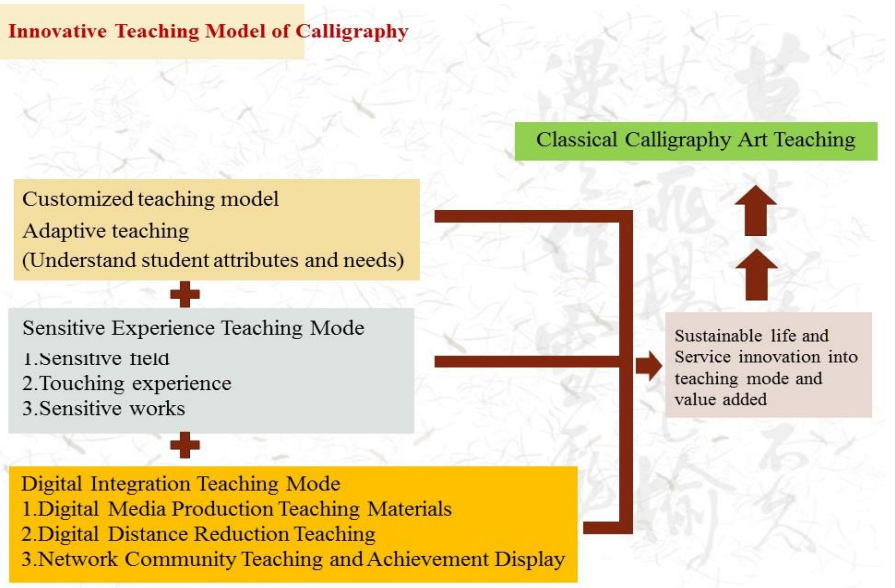


**Figure1.** Integration of Calligraphy Instruction into Sustainable life and Service Innovation Model

# 4. Conclusions

It is very important to continue the inheritance of calligraphy art with profound national aesthetic characteristics through teaching and inheritance. Therefore, with contemporary innovative thinking, calligraphy teachers apply innovative models to enhance teaching advantages and meet the needs of learners. the researcher suggested four effective teaching practices. 1.Applying the concept of Sustainable life to teaching media and cultural creative works to promote contemporary environmental awareness. 2.Calligraphy instruction needs to be learner-centered, highly adaptable and sensitive to the individual needs of learners. 3. In order to provide professional new teaching services, the " sensibility experience " teaching service mode is adopted to make learners more satisfied and fulfilled..4. Digitalized instruction. An instructor needs to make good use of the integration of digital and information technologies to create diverse instructional materials. By means of online learning communities, teaching and learning are no longer subject to the restrictions of time and space. This research initially attempts to integrate the classical art teaching into the current situation with the concept of contemporary innovation strategy to enhance learner satisfaction. This study is expected to have reference significance for subsequent related course practice and research.

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## （Short Communication）

# Exploring the Connection among Personality, Playing Styles and Career Development—Using Fencing as an Example

Li-Shiue Gau[a*], Jui-Chuan Huang[b]

## Abstract

This research project attempts to use three different dimensions of personality (agreeableness, openness to experience and extraversion) to predict playing styles in fencing movements. It is hypothesized that personality is related to offensive or defensive playing styles. It is also hypothesized that playing styles can be related to a person's career development. In the first study, 60 participants completed a questionnaire about their personality and then to answer another questionnaire about their imagined playing styles if they had a chance to play fencing after watching seven short clips related to fencing. The relationship between the level of extraversion and offensive playing styles is positive and significant with a coefficient 0.28 ($p < 0.05$). The second study recruited 10 male employees, who answered personality questionnaire, experienced a three-hour fencing course with a final competition, recorded their EEGs (electroencephalogram) and BVPs (blood volume pulse) prior and after the course, and accepted interviews.

The two participants who entered the final championship tended to have more offensive than defensive movements. They seemed to enjoy the sport and relax after the course in terms of increase in Alpha power and decrease in the ratio of low frequency power to high frequency power by the measures of EEG and BVP. The interviews revealed that athletic talent, a level of situational involvement, and personal values associated with the sport and the competition may play moderating roles to influence the relationships among personality, playing styles, and physiological signals. Career development likely related to playing styles not only in the job categories but also in the level of positions. Future research in this issue might need to examine personality further in terms of implicit and explicit traits.

**Keywords:** Fencing, Personality, Playing Style, Career Development.

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# 1. Introduction

Human personality is usually treated as enduring traits that describe how people tend to think and behave (Gailliot, Gau, & Stillman, 2015). The Big Five model or the Five Factor model is probably the most popular and useful to describe the enduring mental and behavioral dispositions of individuals, which includes 5 dimensions or factors: agreeableness, openness to experience, extraversion, conscientiousness, and neuroticism (Goldberg, 1993; John & Srivastava, 1999; McCrae & Costa, 1997). This research project attempts to use three different dimensions of personality (agreeableness, openness to experience and extraversion) to predict playing styles in fencing movements.

It is hypothesized that a person with a high level of agreeableness usually has characteristics that are perceived as sympathetic, cooperative, warm, considerate, and friendly, and thus might tend not to be too much aggressive in playing styles. Second, it is hypothesized that a person with a high level of openness to experience will often enjoy seeking out new, unconventional, unfamiliar experiences and venturing beyond a comfort zone, and thus might tend to try offensive movements for scoring in fencing. Third, it is hypothesized that a person with a high level of extraversion is expected to be assertive, energetic, sociable, outgoing, and talkative, might be more aggressive than conservative (Parks-Leduc, Feldman, & Bardi, 2015), and would have more offensive than defensive movements in fencing. Finally, it is hypothesized that personality and playing styles can be related to a person's career development.

# 2. Methods

Two studies were conducted in this research project to examine the hypotheses. The first study recruited 91 college students in the middle of Taiwan. In the first step, participants answered a questionnaire about their personality. Then, one week later, participants were asked to watch seven short clips on the YouTube, which introduced fencing (3 clips: 33 seconds, 2 minutes and 5 seconds, 5 minutes and 32 seconds), reported fencing news (3 clips: 2 minutes and 30 seconds, 1 minute and 55 seconds, 1 minute and 32 seconds), and broadcasted a competition of fencing (12 minutes and 17 seconds). After watching the clips, participants answered another questionnaire about their imagined playing styles if they had a chance to play fencing. In total, 60 participants completed both of the first and the second steps with 14 males and 46 females.

The second study recruited 10 male employees from a company in the middle of Taiwan. Five participants were between 32 and 38 years old; four participants were between 40 and 46;

one participant was 53 years old. Participants received overtime payment and were provided a lunch meal. Information about participants' position, job description, and personality evaluation was provided by the company with careful confidentiality.

Prior to experiencing the three-hour fencing course, participants answered personality questionnaire, and took measures about their physiological signals in terms of both EEG (electroencephalogram) and BVP (blood volume pulse) recorded at the same time for one and half minutes with eyes open in resting and listening to meditation music. During the experiential course of fencing, the coach introduced this sport of fencing and its rules of competition, led all participants doing warm-up and practicing basic skills, and in the end arranged a competition among the participants. In the competition, coach recorded participants' playing styles. After the fencing course, all participants' EEG and BVP were recorded again for one and half minutes. Interviews were followed with participants to learn their feelings, emotions, and attitudes toward these fencing experiences.

# 3. Results and Discussions

## 3.1 The First Study

Analyses of correlation coefficients showed that the relationship between the level of agreeableness and offensive playing styles tends to be negative but not significant. The relationship between the level of openness to experience and offensive playing styles tends to be positive but not significant. The relationship between the level of extraversion and offensive playing styles is positive and significant with a coefficient 0.28 ($p < 0.05$). The third hypothesis was supported.

## 3.2 The Second Study

The two participants who entered the final championship were 33 and 53 years old, were athletic and outgoing, and tended to have more offensive than defensive movements. They seemed to enjoy the sport and relax after the course in terms of increase in Alpha power and decrease in the ratio of low frequency power to high frequency power by the measures of EEG and BVP. Both of the two participants are big truck drivers.

Another participant working in the department of professional design is also athletic but has an introverted personality evaluation. However, he said he was extroverted when getting together with familiar friends. His playing movements tended to be more offensive. One participant is a marketing manager with an apparent personality of extraversion. His playing style tended to have more defensive movements. Scoring in the competition may not be his major concern. Friendship and sociability may be more important for him.

One participant is a top manager. His personality tended to be sympathetic, open to new things

but not to be outgoing. His playing style tended to be balance between offensive and defensive. His physiological signals showed similar feelings and emotions prior and after the course. It seemed that he might keep a neutral attitude toward the course and avoid emotional influence by the course.

Two other participants who are working in professional design and sales departments may have similar neutral attitudes and tend to have some more defensive movements. One participant is a technician with shy personality and tends to have more defensive movements. The final two participants that are workers with professional skills look like introverted and might be hesitated to show their emotions. However, they seemed to be immersed in the course and care the competition. They tended to have balance between offensive and defensive movements. Their physiological signals indicated their relaxation after active participation. This experience for them might be similar to an escapist experience (Pine & Gilmore, 2011).

# 4. Conclusions

This research project concludes a connection among personality, playing styles and career development. However, the connection is more complicated than imagined because athletic talent, a level of situational involvement, and personal values associated with the sport and the competition may play moderating roles. Career development might be related to playing styles not only the job categories but also the level of positions. Future research in this issue might need to examine personality further in terms of implicit and explicit traits.

# Acknowledgments

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（Short Communication）

# Examining Sport Provision Diversity at Universities in Vietnam: Personality Traits, Personal and Cultural Values, and Diversity Value Orientation

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## Abstract

This study aims to examine how values and personality traits contribute to perceived school lifestyle from a sport diversity perspective. Sport provision diversity at schools in this study refers to various resources or opportunities for students to participate or watch in different types of sports. It is hypothesized that personal and cultural values would influence diversity value orientation (DVO) and then further impact students' attitudes toward sport provision diversity. Diversity value orientation (DVO) refers to awareness and acceptance of both the similarities and differences that exist among people.

A total of 238 questionnaires were collected in Vietnam with 140 females and 98 males. Regression analyses showed that the explained variance of diversity value orientation (DVO) was 73.3% by the four predictors: Openness to experience (OE), self-direction (SD), stimulation (S), and low power distance (LPD), but the regression coefficient of OE is not significant. The explained variance of attitudes toward sport provision diversity is 59.0% by SD, S, LPD and the mediator DVO, which partly mediates the relationship between LPD and sport diversity attitudes. Correlation coefficients among the six variables are between 0.594 and 0.835. Possible limitations of this study were that many samples were the first year students (n=139, 58.4%) and were from the same universities. Thus, a bias of common method variance might exist.

**Keywords:** Sport Diversity, Personality, Personal Value, Diversity Value Orientation.

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# 1. Introduction

This study aims to examine how one personality trait (openness to experience, OE), one cultural value (low power distance, LPD), two personal values (self-direction, SE; stimulation, S), and diversity value orientation (DVO) contribute to perceived school lifestyle from a sport diversity perspective. Sport provision diversity at schools in this study refers to various resources or opportunities for students to participate or watch in different types of sports. Toward sport provision diversity, students' attitudes indicate their enduring favorable or unfavorable evaluations and emotional feelings (Gau & Kim, 2011). Prior studies have revealed that values are determinants of attitudes (Rokeach, 1973, 1979). Likewise, values may impact attitudes toward sport diversity.

Diversity value orientation (DVO) originated from the defintion of Universal-diverse orientation (UDO), which refers to awareness and acceptance of both the similarities and differences that exist among people (Miville, Gelso, Pannu, Liu, Touradji, Holloway, & Fuertes, 1999). UDO was conceptualized by three interrelated domains: Behavioral (that is, desire to experience diverse interactions), cognitive (that is, appreciation of similarities and differences between oneself and others), and affective (that is, felt comfort with diverse others) (Fuertes, Miville, Mohr, Sedlacek, & Gretchen, 2000). Adjusted from the original UDO, DVO focuses on positive statements of value orientation in order to fit the model as a mediator for the relationships between values and sport diversity attitudes. Due to different features within different types of sports, different sports may attract different groups of people. Thus, higher DVO may encourage more positive attitudes toward sport diversity.

As for the precursors of DVO, in a study with counselor trainees, one of the Big Five personality traits, openness to experience (OE), was shown to positively relate with DVO (Thompson, Brossart, Carlozzi, & Miville, 2002). Individuals with high - OE are normally intellectually curious, behaviorally flexible, and nondogmatic in their attitudes and values (McCrae & Costa, 1997), and therefore are more likely to have a higher level of diversity value orientation.

Additionally, power distance (strength of social hierarchy) is one of the five dimensions of Hofstede's cultural theory (Hofstede, 2011). This dimension represents the expectation and acceptance degree of less powerful members of a society to power's unequal distribution. Accordingly, it is likely that low power distance (LPD) in cultural values may provide a better atmosphere to have higher DVO than high power distance does.

In personal values, both self-direction (SD), which comes from organisms' needs for

autonomy, and stimulation (S), which stems from the needs of presumed organisms for variety, tend to be openness to change (Schwartz & Rubel, 2005; Struch, Schwartz & van der Kloot, 2002), and more emphasis on these two values would cultivate higher DVO. Given reasoning above, it is hypothesized that personality traits, cultural and personal values would influence diversity value orientation (DVO) and then further impact students' attitudes toward sport provision diversity.

## 2. Methods

A total of 238 questionnaires were collected in Vietnam with 140 females and 98 males. An online survey was conducted on December, 2018 among university students from northern Vietnam. Participants were recruited via mailing lists, social networks, and lecturers.

A value and sport diversity questionnaire that participants completed via the online system of Google Form was used to determine traits (OE, 5 items), values perspective (LPD, 5 items; SD, 5 items; S, 5 items; DVO, 8 items), and find out the school life style from a sport diversity perspective (6 items) of Vietnamese university students. All scales were created based on previous studies with accepted validity in English and then translated into Vietnamese by three co-authors along with a back-translation by 8 students to validate the Vietnamese version. Respondents were asked to evaluate "to what degree they agree with these statements" on a seven-point scale, where "strongly disagree" equals 1 and "strongly agree" equals 7.

## 3. Results and Discussions

Scale reliabilities, Cronbach's Alphas, for the six variables were between 0.818 and 0.953. Regression analyses showed that the explained variance of diversity value orientation (DVO) was 73.3% by the four predictors: openness to experience (OE), self-direction (SD), stimulation (S), and low power distance (LPD), but the regression coefficient of OE is not significant. Nevertheless, the correlation coefficient showed that the relationship between OE and DVO is significant (0.664, $p < 0.05$).

The explained variance of attitudes toward sport provision diversity is 59.0% by SD, S, LPD and the mediator DVO, which partly mediates the relationship between LPD and sport diversity attitudes (Figure 1). Correlation coefficients among the six variables were between 0.594 and 0.835.

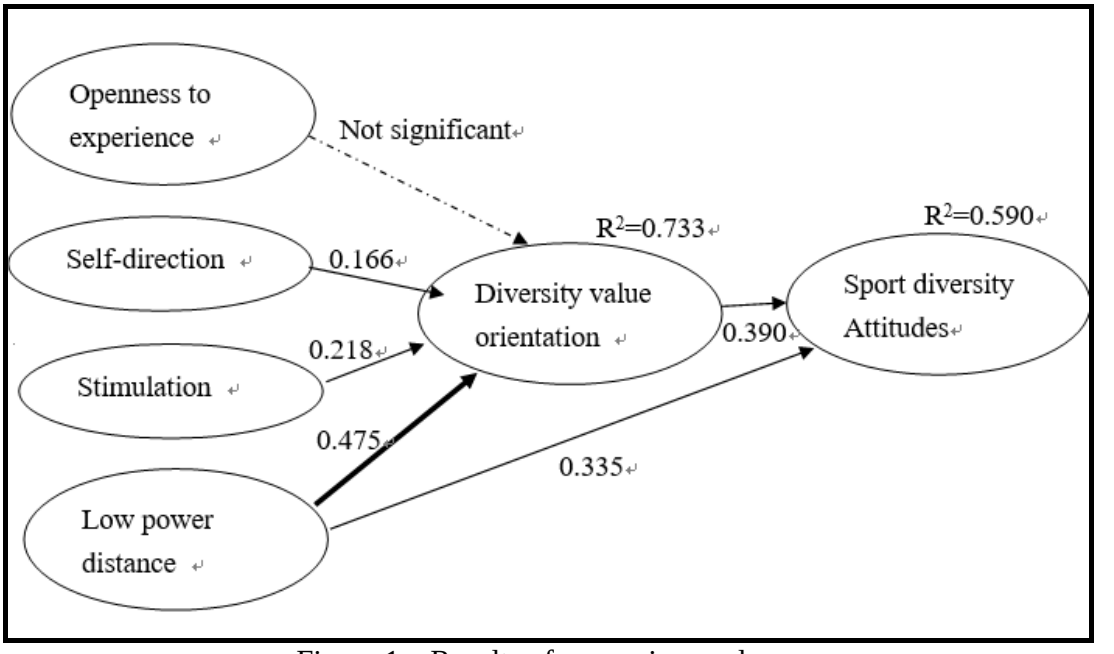


Figure 1 Results of regression analyses

The results found that the power distance level of Vietnamese students who participated in the study was not high. This finding might not be consistent with Hofstede's data (Hofstede insights, 2019), which categorized Vietnam among high power distance cultures. This might be because power distance tended to decrease in parallel to the development of Vietnamese society. For example, according to World Bank's report, gender gaps in Vietnam are narrowing over the past 30 years of economic and political reforms (The World Bank, 2019). The results indicated that low power distance played a major predictor of diversity value orientation and sport diversity attitudes in the model.

# 4. Conclusions

This study constructed a model to explain that sport diversity attitudes (SDA) can be related to personality, cultural and personal values, and diversity value orientation (DVO). A campus where diverse values are encouraged may cultivate students with sport diversity attitudes (SDA). Possible limitations of this study were that many samples were the first year students (n=139, 58.4%) and were from the same universities, which might lead to the existence of a bias of common method variance.

# Acknowledgments

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# Evaluation of User Satisfaction on Search Engine Marketing for Local Wisdom Herbal Cosmetic Products Website in community Enterprise

Achaporn Kwangsawad*, Kannika Boonkasem,
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Komsan Srivisut

## Abstract

This paper aims to evaluate user satisfaction of search engine marketing based on the marketing mix 4Ps, i.e. price, place, product, and promotion, for websites related to herbal cosmetic products of local wisdom community enterprise in Thailand. Besides those of the marketing mix, this research also aims to understand additional user requirements, which may lead to higher customer satisfaction. The evaluation, in particular, was conducted based on a rating scale, open-ended questionnaire, which was answered by 400 random samplings, i.e. Internet users. Regarding the basic statistical analysis, together with the content analysis, the results indicate that, overall, the users were highly satisfied with such the search engine marketing of the herbal cosmetic website. The users were also pleased with the promotion offered and were attracted to the website at a high rate. However, users expected more diverse items of cosmetic products and more options for payment.

**Keywords:** User Satisfaction, Search Engine Marketing, Herbal Cosmetic products, Community Enterprise.

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# 1. Introduction

The marketing mix is the combination of ways and activities that firms used to sell their products and services. The entire success of the corporate generally lies within the product quality, as well as the belief and loyalty of the customers to such the company. The consumer behavior analysis is crucially important for a promotion as it provides insights into the customers' needs, which directly affect sales and relationships of organization management.[1][2][3]

Search engine marketing (SEM) is online marketing on search engine results pages or SERPs. Accordingly, by promotion to targeted customers, which is search engine users to known the website products or services. Moreover, bring the total number of users of the website and increased opportunities to sell products and services to even more.Nevertheless, Organic search or Natural search which relies on the market through the channel search engine optimization. Moreover, the simplified method is writing articles related to products or services with insertion into the desired article itself. Consequently, appear on the first page or top of the search engine results page on the web search engine such as Google, Bing, and Yahoo, when the customer’s search with keyword involved. Especially, community enterprises of herbs and cosmetics have only public relations website. However, it has not activities marketing via the Google Search Engine. Most buyers like searching for information on the search engine.

Researchers have proposed various factors for measuring the satisfaction of website visitors. However, there is less research conducted on the differential impact of the marketing mix 4p; price, place, product, and promotion on user satisfaction of the website. Consequently, it would imply that user satisfaction is believed jointly of the foremost necessary dependent variables for activity success in search engine marketing to capture users overall expertise with the marketing mix 4p trustiness and services provided

**Research Objective**

1. To evaluation of user satisfaction on search engine marketing for local wisdom herbal cosmetic products website in community enterprise
2. To elicit supplemental opinions and suggestions.

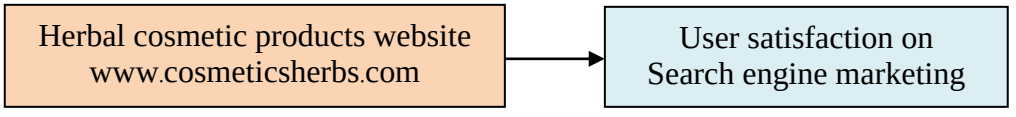


Fig.1. conceptual framework

# 2. Material and Methods

In this research, the survey research that aimed to find out the level the user satisfaction to search engine marketing for local wisdom herbal cosmetic products website visitors used.

***Population and Samples***

This research was to evaluation of user satisfaction of search engine marketing for local wisdom herbal cosmetic products website in community enterprise in 4 aspects: the price of herbal cosmetic products website, the place of herbal cosmetic products website, the products of the website and the promotion of herbal cosmetic product website which consisted of population and samples as follows:

The population of this research was internet users. Samples of the research were 400 internet users derived through simple random sampling technique. Moreover, the instruments used for gathering the data were the rating-scale, an open-ended questionnaire. Moreover, the statistics used for analyzing the data were frequency, percentage, mean, standard deviation, and content analysis.

***Instrumentation***

The instruments used in this study are website and questionnaire. The website was www.cosmeticsherbs.com, and the questionnaire constructed by the researcher based on evaluation of user satisfaction of search engine marketing for local wisdom herbal cosmetic products website in community enterprise The first part(Part 1) of this questionnaire asks for the demographic information on their genders, ages, careers, income, and education level. The participants asked to report their information by ticking in only one box.

The second part concerns user satisfaction of herbal cosmetic products website. This part comprises 18 items of user satisfaction of search engine marketing for local wisdom herbal cosmetic products website in community enterprise in 4 aspects: 6 items of products, three items of the price, six items of place, and three items of promotion.

The participants asked to check by one box under The five levels of importance on each item in Part 2 to indicate their evaluation of user satisfaction of search engine marketing for herbal cosmetic products website in each area listed in the questionnaire. Reliability defined as the proportion of the alpha is a lower bound of the actual reliability of the research instrument or the questionnaire. The descriptive statistics are also used to determine the individual summary statistics for each of 18 items of the questionnaires

The third part asks for more suggestions of evaluation of user satisfaction of search engine marketing for herbal cosmetic products website, which based on open-ended questions.

**Data collection**

Evaluation of user satisfaction of search engine marketing for herbal cosmetic products website used questionnaire online from internet users. Part 1: concerns the demographics of their genders, ages, careers, income, and education level. The 18 items of Part 2 cover user satisfaction of search engine marketing for herbal cosmetic products website. Also, the participants were requested to consider each item carefully was for their total of 400 internet users completed the questionnaire.

The data analysis research conducted using descriptive statistics. Responses were to report their demographic data and to indicate the rank order of the items in each of user satisfaction of search engine marketing for herbal cosmetic products website listed in the questionnaire.

**Analysis of data from the questionnaires**

Analysis of data from the questionnaires scales score was calculated to obtain the mean, standard deviation, and then translation criteria developed by Best (1977)[4] as follows that:

1.00 <= $\bar{x}$< 1.50 refers to the satisfaction of website users at the lowest level.

1.51 <= $\bar{x}$ < 2.50 refers to satisfaction of website users at low level.

2.51 <= $\bar{x}$< 3.50 refers to the satisfaction of website users at a moderate level.

3.51 <= $\bar{x}$< 4.50 refers to the satisfaction of website users at a high level.

4.51 <= $\bar{x}$< 5.00 refers to the satisfaction of website users at the highest level.

**The statistics used**

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

# 3. Results and Discussions

## Results

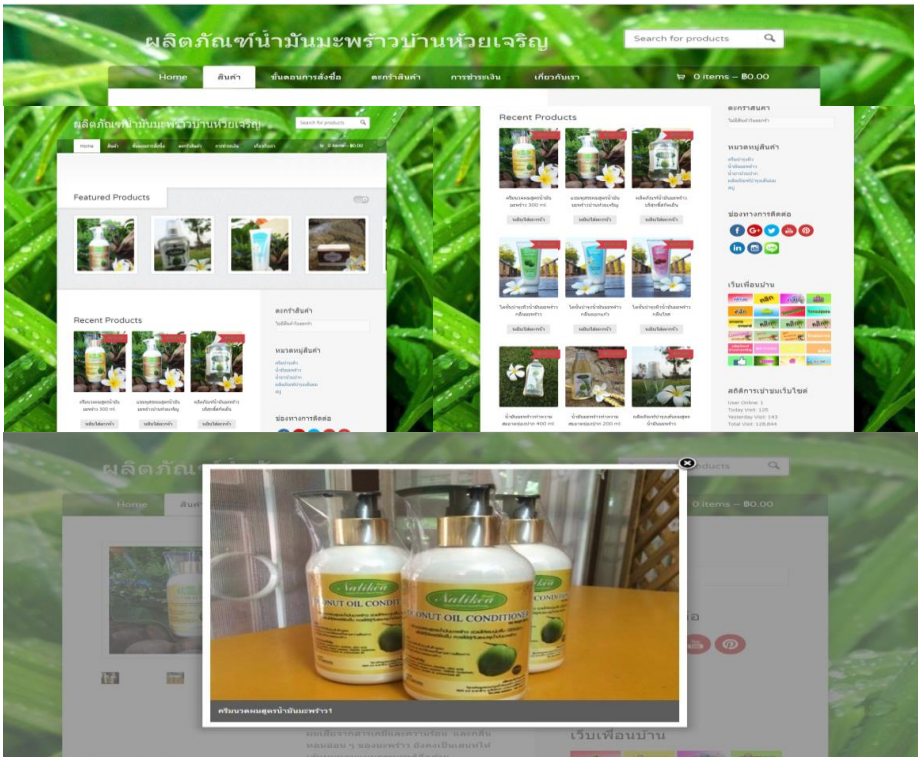


Fig. 2. The herbal cosmetic product website (cosmeticsherbs.com)

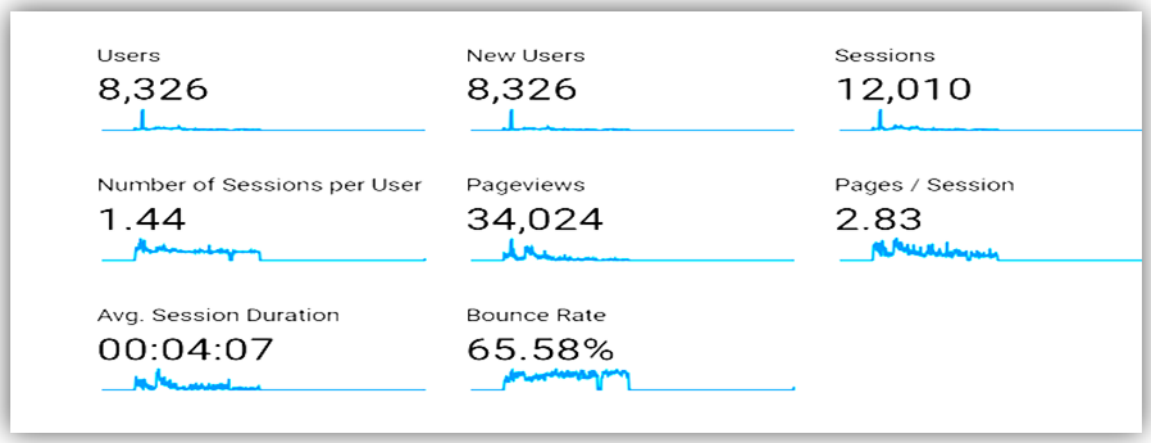


Fig. 3. Users of the website (cosmeticsherbs.com) from Google Analytics

Google Analytics is a program that tracks website statistics. It is a free Google application with data of website showed that; users, new users, sessions, Number of sessions per user, page views, pages/session, average session duration, and bounce rate. Consequently, herbal cosmetic products website is www.cosmeticsherbs.com have website statistics as shown in Fig.3

***Results of Data Analysis***

Phase 1: The results of the demographic variable of internet users presented in the first section deals with genders, ages, careers, income, and education level as the following table.

Table 1**:** The results of the demographic data of respondents

| | | N=400 | Percentage |
|---|---|---|---|
| Sex | Male | 183 | 45.75 |
| | Female | 217 | 54.25 |
| Ages | 20 ≦age | 52 | 13 |
| | 21 ≦age ≦30 | 61 | 15.25 |
| | 31 ≦age ≦40 | 131 | 32.75 |
| | 41 ≦age ≦50 | 127 | 31.75 |
| | age＜50 | 29 | 7.25 |
| Careers | Student | 76 | 19 |
| | Business owner | 51 | 12.75 |
| | Employee | 145 | 36.25 |
| | Government office / State enterprise officer | 128 | 32 |
| Income | 5,000 < | 76 | 19 |
| | 5,000-10,000 | 116 | 29 |
| | 10,001-15,000 | 138 | 34.50 |
| | 15,001-20,000 | 46 | 11.50 |
| | < 20,000 | 24 | 6 |
| Education | High School or below | 55 | 13.75 |
| | Junior College | 123 | 30.75 |
| | Bachelor | 198 | 49.50 |
| | Master or above | 24 | 6 |

The table showed that percentages of respondents in genders ranged from 54.25% for female; in ages ranged from 32.75% for 31-40 year, in careers range from 36.25% for the employee, in income ranged from 34.50% for 10,001-15,000 baht; in education ranged from 49.50% for bachelor degree.

**Phase 2: user satisfaction for herbal cosmetic products website**

The evaluation for user satisfaction of Search Engine Marketing for Local wisdom Herbal cosmetic products website in Community Enterprise was done using the instrument of Questionnaire for user satisfaction of Herbal cosmetic products website.

Table 2**:** The results of the area of *Product* in the overall aspect

| **Product** | $\bar{x}$ | **S.D.** | **Level** |
|---|---|---|---|
| 1. The herbal cosmetic products used are of good quality. | 4.35 | 0.68 | high |
| 2. The community enterprise provides varied types of herbal cosmetic products | 4.32 | 0.73 | high |
| 3. The herbal cosmetic products provided meet expectations | 4.29 | 0.74 | high |
| 4. The herbal cosmetic products are famous | 4.52 | 0.70 | highest |
| 5. The herbal cosmetic products are full details on the website | 4.22 | 0.67 | high |
| 6. Show the herbal cosmetic products are picture clear on the website | 4.44 | 0.71 | high |
| **Total** | **4.36** | **0.68** | high |

The table above indicated that the satisfaction of website users had a high level of herbal cosmetic products website in the area of product overall ($\bar{x}$ = 4.36).

Table 3**:** The results of the area of Price overall and each item

| **Price** | $\bar{x}$ | **S.D.** | **Level** |
|---|---|---|---|
| 1. Price is reasonable following the herbal cosmetic products quality | 4.38 | 0.77 | high |
| 2. Price is reasonable following the service quality | 4.18 | 0.69 | high |
| 3. To purchase products on the website are cheaper than buying through other channels | 4.29 | 0.74 | high |
| **Total** | **4.28** | **0.68** | **high** |

The table above indicated that the satisfaction of website users had a high level of herbal cosmetic products website in the area of price in overall ($\bar{x}$ = 4.28).

Table 4**:** The results of an area of Place in overall and in each item

| **Place (www.cosmeticsotop.com)** | $\bar{x}$ | S.D. | Level |
|---|---|---|---|
| 1. Website's service is accurate. | 4.29 | 0.77 | high |
| 2. Users receive feedback quickly | 4.31 | 0.68 | high |
| 3. Users feel safe to enjoy service. | 4.35 | 0.61 | high |
| 4. Website easy to remember | 4.26 | 0.66 | high |
| 5. Websites consider the internet of users. | 4.30 | 0.69 | high |
| 6. Website is easy to access | 4.46 | 0.70 | high |
| **Total** | **4.33** | **0.66** | **high** |

The table above indicated that the satisfaction of website users had a high level of herbal cosmetic products website in the area of the place overall ($\bar{x}$ = 4.33).

Table 5**:** The results of an area of Promotion in overall and in each item

| **Promotion** | $\bar{x}$ | S.D. | Level |
|---|---|---|---|
| 1. There are public goods through other channels, such as video. | 4.51 | 0.74 | highest |
| 2. The promotional activities on the website, such as seasonal discounts offered. | 4.30 | 0.69 | high |
| 3. There is an advertisement on online media, such as Facebook, | 4.47 | 0.77 | |

| | | | |
|---|---|---|---|
| Google | | | high |
| **Total** | **4.43** | **0.70** | **high** |

The table above indicated that the satisfaction of website users had a high level of herbal cosmetic products website in the area of promotion in overall ($\bar{x}$ = 4.43).

**Phase 3**: The results of suggestions of Evaluation of user satisfaction of search engine marketing for local wisdom herbal cosmetic products website in community enterprise as following:

1. The local wisdom herbal cosmetic products website was attractive.
2. The products do not include a variety of items for the customers to choose various goods items
3. The payments should be more channels to pay with the credit card or other electronic payments.
4. The promotional for products was a discount at the festivals. Moreover, primarily herbal cosmetic products have good quality.

**Discussion**

According to the study data analysis and the results of this study could be discussed as follows. Evaluation of user satisfaction of search engine marketing for local wisdom herbal cosmetic products website in community enterprise was at a high level. It might be because website users preferred the Promotion about herbal cosmetic products website, which is search engine users to known the website products or services. Moreover, the popularity of search engine marketing which increased through internet accessibility. Consequently, online marketing on search engine results in pages. It was a channel of marketing by promotion to targeted customers. [5] [6] [7]

# 4. Conclusions

According to the study and data analysis and the results of this study were concluded as follows:

1. Evaluation of user satisfaction of search engine marketing for local wisdom herbal cosmetic products website in community enterprise, when considered in each aspect. It found that Promotion about herbal cosmetic products website was at a high level, product about herbal cosmetic products website, and place about herbal cosmetic products website was at a high level.

2. User satisfaction of search engine marketing for local wisdom herbal cosmetic products website had various suggestions such as; the local wisdom herbal cosmetic products website was attractive, but the products do not a variety of items for the customers to choose various goods items. However, the payments should be more channels to pay with a credit card or other

electronic payments. Moreover, the promotional for products was a discount at the festivals. Especially in herbal cosmetic right quality products.

## Acknowledgments

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# An Analysis of Property Investment Decisions in Thailand

Rapheephorn Phencharoenkit*, Cheng Chieh-Yu

## Abstract

With the rise of Association of Southeast Asian Nations (ASEAN), Thailand's economy has risen rapidly, attracting foreign investment from various countries around the world. In 2018, Thailand has received more than 40 million visitors from all over the world, and 10% could be potential investors in Thailand. Thailand's Property market will be facing series of changes including an increased policy rate. The mortgage regulations turned more strictly due to an upcoming general election in 2019, while new land and property tax and new Bangkok City Plan are expected to come into effect in 2020.

For the purposes of this study, a number of experts were interviewed and a large amount of data on the factors affecting investment decisions were gathered. FAHP was employed to determine the relative weight of each investment decision-making factor and provide valid information to potential investors coming to Thailand.

The results of the study show that out of the five analyzed factors, the investment environment area (26%) is predominantly important, followed by political stability (22%), legal norms (19%), return on investment (18%), and management cost (15%). Investors who chose to invest in Thailand's Property market should take these factors into consideration prior to making their investment decisions. Choosing a specific area with unique qualities and a good developer, can particularly reduce the investment risks.

**Keywords:** Fuzzy Analytical Hierarchy Process (FAHP), Property, Investment.

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# 1. Introduction

The rise of ASEAN, more and more people have gone to ASEAN countries to invest in real estate. For some people investment was profitable and they turned real estate into the main business, but some people experienced investment failures, faced unclear local market conditions and laws and regulations, suffer misappropriation.

Thailand is a big country in the ASEAN. In recent years, the real estate market has been booming. However, Thailand still faces many challenges. There are many uncertainties such as political and economic policies.

Should you continue to invest in Thailand? When investing in Thai real estate what do you need to consider? What should be invested in? What matters need attention? What can real estate developers do to dispel doubts of investors?

Therefore, this study will explore the decision-making analysis of investment in real estate in Thailand through relevant literature and fuzzy hierarchy analysis. FAHP can take into account people's ideas. When mind and the situation is ambiguous, different decisions can be reached with different goals in. The investors are expected to grasp the market information and to understand how to more openly a companies can confidently invest in real estate in Thailand. It is expected that this research will enable investors to better understand the Thai market and enable real estate developers to provide more accurate information for investors.

# 2. Material and Methods

In this paper, I used FAHP to evaluate Property Investment Decisions in Thailand. A FAHP method based on the Fuzzy Sets. Theory and on the Analytic Hierarchy Process (AHP) is proposed. It uses a Hierarchical structure to abstract, decompose, organize and control the complexity of decision involving many attributes, and it uses informed judgment or expert opinion to measure the relative value or contribution of these attributes and synthesize a solution.

Fuzzy multiple attribute decision-making methods have been developed owing to the imprecision in assessing the relative importance of attributes and the performance ratings of alternatives with respect to attributes. The analytic hierarchy process: Analytic Hierarchy Process (AHP) is one of multi measures decision-making technique that was originally developed by (Saaty 1980; Saaty 1991). AHP is a method of breaking down a complex, unstructured situation into its components parts; arranging these parts, or variables, into a hierarchic order; synthesize the judgments to determine which variables have the highest priority and should be acted upon to influence the outcome of the situation.

Fuzzy Analytic Hierarchy Process (FAHP) embeds the fuzzy theory to basic Analytic Hierarchy Process (AHP), which was developed by Thomas L. Saaty. AHP is a widely used decision-making tool in various multi-criteria decision-making problems. It takes the pair-wise comparisons of different alternatives with respect to various criteria and provides a decision support tool for multi-criteria decision problems. In a general AHP model, the objective is in the first level, the criteria and sub-criteria are in the second and third.

FAHP self indicates, is to provide the reader with a background to the study, and hence to smoothly lead into a description of the methods employed in the investigation. So in this paper we use FAHP to analysis of Property Investment Decisions in Thailand. The first step in the AHP procedure is to make pair wise comparisons between each criterion.

Table 1 Fuzzy values

| ASSESSMENT | AHP VALUE | FUZZY NUMBER |
|---|---|---|
| Very poor | 1 | (1,1,3) |
| Poor | 3 | (1,3,5) |
| Moderate | 5 | (3,5,7) |
| Good | 7 | (5,7,9) |
| Very good | 9 | (7,9,9) |

Results of the comparison (for each factors pair) were described in term of integer values from 1 (equal value) to 9 (extreme different) where higher number means the chosen factor is considered more important in greater degree than other factors being compared with Consistency of pair-wise comparison matrix: In classical AHP, we consider an nxn pairwise comparison matrix A with positive elements such that..

$$A = \begin{bmatrix} 1 & a_{12} & \cdots & a_{1n} \\ a_{21} & 1 & \cdots & a_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ a_{n1} & a_{n2} & \cdots & 1 \end{bmatrix}$$

Index of consistency for random Judgments, Thomas L. Saaty (1980) defined the consistency ratio (CR) as: CR = $\frac{CI}{RI}$ Where RI is the average value of CI for random matrices using the given scale Saaty (1980).

Table 2 values of RI

| M | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CI | 0.00 | 0.00 | 0.58 | 0.90 | 1.12 | 1.24 | 1.32 | 1.41 | 1.45 | 1.49 | 1.51 | 1.48 | 1.56 | 1.57 | 1.59 |

Through the AHP pairwise comparison proposed by Saaty, the consistency test was conducted to ensure the validity of the questionnaire results. The consistency index (C.I.) and consistency ratio (C.R.) were both less than the tolerable standard of consistency (C.I. < 0.1,

C.R. < 0.1). CR 0.1 ≤ is preferred, and the maximum tolerance must not be >0.2. Those that fail to reach the standard criteria were eliminated.

# 3. Results and Discussions

Thailand is a fairly developed economy with an upper-middle-income status. Situated in the heart of Southeast Asia, the country serves as a gateway to one of the world's most dynamic markets. 2019 will be a year with significant changes in Bangkok's property market.

### 3.1 Foreigners Law

According to 1979 Thai Condominium Act, any type of property in Thailand can be owned up to 49 percent by foreigners, which also goes for condos and apartments, but in this case the law applies to the unit space and not individual units.

As an example, let's say there is a condominium project consisting of 100 equally sized units. According to the law, 51 of those units can be owned by Thai citizens and the remaining 49 units can be owned by non-Thai citizens.

The only requirement that foreigners need to meet in order to be granted a foreign freehold land title for a condominium unit is that the funds used to purchase the condominium must be transferred into Thailand from abroad.

Upon receipt of overseas remittances, Thai banks will issue a Foreign Exchange Transaction Form (FETF) which needs to be presented at the land office when transferring a unit.

Foreigners can buy land, houses and villas in Thailand by setting up a Thai company. The company will have to be owned 51% by Thais and 49% by foreigners to accommodate the law. Owning a property this way is referred to as Thai Freehold, as the Thai company will own the property as an asset just as if a Thai citizen would own it under their own name. Though Thai Property Laws prohibit a foreigner from owning land in Thailand, there are other alternatives to owning land in Thailand.

Using A Company. A foreigner may own a land in Thailand in a name of Thai company (at least 51% of shares are Thai and 49% are foreign). This can be done as a Thai Limited Company or a registered Thai Partnership. The most common form of company registered in Thailand is the Thai Limited Company. If a company is going to support a work permit application, a two millions baht capital is required for each work permit.

Board of Investment (BOI) A foreigner, who invests in a minimum of at least one million Baht in Thailand for no minimum prescribed period of time, is entitled to buy up to 20 Rai of land for residential purposes for employees.

Married to A Thai National. In 1999 the Thai property law was amended to allow a foreigner with a Thai spouse to legally own land in Thailand.

### 3.2 Characteristics of the respondents

Table 3 Description of each indicator

| Evaluation Aspect | Assessment Indicators | Definition |
|---|---|---|
| A1 Investment environment | Economic resources | Economic resources are the factors used in producing goods or providing services. In other words, they are the inputs that are used to create things or help you provide services. Economic resources can be divided into human resources, such as labor and management, and nonhuman resources, such as land, capital goods, financial resources, and technology. |
| | Human capital | There are a lot of Human capital, a lot of people, and it is easy for employers to find employees. |
| | Job opportunities | There are many job opportunities and people can easily find a job. |
| | Transport network | A transport network, or transportation network is a realization of a spatial network, describing a structure which permits either vehicular movement or flow of some commodity. |
| A2 political stability | Standing army | A standing army, unlike a reserve army, is a permanent, often professional, army. It is composed of full-time soldiers and is not disbanded during times of peace. |
| | Racial, religious integration | National integration is the awareness of a common identity amongst the citizens of a country. It means that though we belong to different castes, religions and regions and speak different languages we recognize the fact that we are all one. |
| | Civil Liberties | People's lives are free and unconstrained, and politics, economy, education, etc. are quite liberal. |
| A3 Legal norms | Perfect Legal | In law, perfection relates to the additional steps required to be taken in relation to a security interest in order to make it effective against third parties or to retain its effectiveness in the event of default by the grantor of the security interest. |

| | | |
|---|---|---|
| | Implementation | Implementation is the realization of an application, or execution of a plan, idea, model, design, specification, standard, algorithm, or policy. |
| | Fair Arbitration | Fair Arbitration, a form of alternative dispute resolution, is a way to resolve disputes outside the courts. The dispute will be decided by one or more persons, which renders the "arbitration award". An arbitration award is legally binding on both sides and enforceable in the courts. |
| A4 Return on Investment (ROI) | Rental Income | Rental income is any payment you receive for the use or occupation of property. |
| | Capital appreciation | Capital appreciation is an increase in the price or value of assets. Capital appreciation may occur passively and gradually, without the investor taking any action. |
| | Liquidity | Liquidity describes the degree to which an asset or security can be quickly bought or sold in the market without affecting the asset's price. |
| A5 Cost Management | Maintenance cost | Maintenance costs such as house depreciation and renovation. The costs associated with the maintenance of any facility, equipment or asset. |
| | Property Management | Property management is the operation, control, and oversight of real estate management indicates a need to be cared for, monitored and accountability given for its useful life and condition. This is much akin to the role of management in any business. |
| | Expense Management | Expense management refers to the systems deployed by a business to process, pay, and audit employee-initiated expenses. These costs include, but are not limited to, expenses incurred for travel and entertainment. |

The results of the study show that out of the sixteen analyzed Assessment Indicators, the Standing army (8.58%) is predominantly important. Fair Arbitration (4.18%) is the least important one. For more detail you can see the table 4.

Table 4 The indicator weighting of FAHP

| Evaluation Aspect | Assessment Indicators | Weighting(%) | Relative weighting(%) |
|---|---|---|---|
| Investment environment 0.26 | Economic resources | 0.29 | 0.0754 |
| | Human capital | 0.25 | 0.0650 |
| | Job opportunities | 0.24 | 0.0624 |
| | Transport network | 0.22 | 0.0572 |
| political stability | Standing army | 0.39 | 0.0858 |

| | | | |
|---|---|---|---|
| 0.22 | Racial, religious integration | 0.27 | 0.0594 |
| | Civil Liberties | 0.34 | 0.0748 |
| Legal norms 0.19 | Perfect Legal | 0.42 | 0.0798 |
| | Implementation | 0.36 | 0.0684 |
| | Fair Arbitration | 0.22 | 0.0418 |
| Return on Investment 0.18 | Rental Income | 0.38 | 0.0684 |
| | Capital appreciation | 0.33 | 0.0594 |
| | Liquidity | 0.29 | 0.0522 |
| Cost Management 0.15 | Maintenance cost | 0.34 | 0.0510 |
| | Property Management | 0.37 | 0.0555 |
| | Expense Management | 0.29 | 0.0435 |

Table 5 The indicator Ranking of FAHP

| Assessment Indicators | Relative weighting | Ranking |
|---|---|---|
| Standing army | 8.58% | 1 |
| Perfect Legal | 7.98% | 2 |
| Economic resources | 7.54% | 3 |
| Civil Liberties | 7.48% | 4 |
| Implementation | 6.84% | 5 |
| Rental Income | 6.84% | 6 |
| Human capital | 6.50% | 7 |
| Job opportunities | 6.24% | 8 |
| Racial, religious integration | 5.94% | 9 |
| Capital appreciation | 5.94% | 10 |
| Transport network | 5.72% | 11 |
| Property Management | 5.55% | 12 |
| Liquidity | 5.22% | 13 |
| Maintenance cost | 5.10% | 14 |
| Expense Management | 4.35% | 15 |
| Fair Arbitration | 4.18% | 16 |

# 4. Conclusions

The investment environment area (26%) is predominantly important, followed by political stability (22%), legal norms (19%), return on investment (18%), and management cost (15%). The Standing army (8.58%) is predominantly important. Fair Arbitration (4.18%) is the least important one.

Investors who chose to invest in Thailand's Property market should take these factors into consideration prior to making their investment decisions. Choosing a specific area with unique qualities and a good developer, can particularly reduce the investment risks.

Experts advise the following:1. Understand foreign investment laws. 2. Choosing a good location. 3.Selecting a well knowns and respected local developer in Thailand. 4. Going to Thailand to inspect the property in person.

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# Success Marketing Factors Contributed to the Green Purchasing on the Real Estate Industry

Shwn-Meei Lee*, Yuet Hung Lau, Gui Ren, Hiroshi Honda

## Abstract

The increase of worldwide environmental problems in recent years draws attention to both the marketing practitioners as well as the consumers. Green marketing has exploded and the trend is still going in an upwards direction. Actually, it can be the solution for those who still fall in the economic downturns. An important challenge facing marketers is to identify which consumers are willing to purchase green products. This study is going to examine the influence of various factors that contributing to the green purchasing that enables organizations to arrive at appropriate strategic decisions to capture the emerging green customers. A conceptual model has been proposed and was subjected to empirical verification with the use of survey of randomly selected household in the San Francisco Bay Area.

**Keywords:** Green Marketing, Green Products, Green Customers, Real Estate, Green. Purchasing Intention.

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# 1. Introduction

In recent years, the media are increasingly direct in informing the public about the environmental problems such as the depletion of the natural resources, air and water pollution, climate change, handling of hazardous and toxic products and so on. Moser and Uzzell (2003) contend that the media's interpretation of pollution levels affect the audience's perception of the seriousness of the pollution problems (Lee, 2009). These ecological issues draw the attention of both the marketing practitioners as well as consumers. There is a growing amount of evidence indicating that consumers are choosing products or avoiding others based on their impact on the natural environment (Laroche, Bergeron, & Barbaro-Forleo, 2001). Indeed, a majority of consumers have realized that their purchasing behavior had a direct impact on many ecological problems (Mostafa, 2007). As a result of the increasing number of green consumers, marketers are targeting the green segment of the population, and they have started differentiating their products and services by using go-green concern and have started utilizing ecological marketing approach as a small competitive edge. Besides, the environmental protection regulations and laws had risen in most countries. This study examined the influence of various factors that were contributing to the green purchasing in the real estate industry that enables organizations to arrive at appropriate strategic decisions to capture the emerging green customer. The San Francisco Bay Area consists of nine counties, 101 cities, and 7,000 square miles (US Census), and it has been a global center of innovation for decades. From the microchip to the next generation solar cells and electric vehicles, the Bay Area is again leading the way to essential innovations, creating vast new economic opportunity, improving our quality of life and safeguarding our resources from the risks of climate change. Residential green building practices include designing and constructing homes that use energy, water, and materials efficiently; have a reduced impact on their physical environment, and promote a healthy indoor environment for you, your family, or your customer (CalRecycle). Many of projects in the bay area, both remodels and new home construction, including passive and active approaches to green building, such as the reduction of energy consumption and the use of sustainable and renewable sources. The US Green Building Council (USGBC) plays an essential role in green building development. USGBC is a nonprofit trade organization committed to expanding sustainable building practices. It formed in San Francisco in July 1993. In March 2000, USGBC created its Leadership in Energy and Environmental Design (LEED) that provides building owners and operators a concise framework for identifying and implementing practical and measurable green building design, construction, operations, and maintenance solutions. As

indicated by USGBC, California is leading by example on energy efficiency and conservation, sustainability, green building and green purchasing practices throughout state government.

California's new building codes took effect January 1, 2011, and policymakers and the industry continue to explore its implications and impact (Dan Geiger, USGBC-NCC). Besides, California provides many programs to encourage solar energy using. Both the California Solar Initiative and the New Solar Homes Partnership can help affordable housing customers Go Solar through partial or full funding for solar energy and solar thermal systems. As stated by Go Solar California, added with the rebates of the California Solar Initiative and other federal tax credits, about half of the cost of the solar power system for a green building covered. These rebates can be for new home construction of single family and multi-family homes, plus for existing homes that convert to a more green and efficient way to use energy.

# 2. LITERATURE REVIEW AND HYPOTHESIS

## 2.1 Green purchasing intention

According to the green marketing research, this study attempted to identify consumer segments who most likely to show concern for the environment and who are accordingly more likely to alter their purchase habits. The review of literature explains the framework used to structure the research. The initial review of literature for this study can divide into three parts: (1)The summaries of literature models. (2)The outlines of variables. (3)The summaries of green building products.

Laroche, Bergeron, and Barbaro–Forleo (2001) developed a model which focuses on the study of the factors that determine the willingness of individuals to pay a higher price for environment friendly products. These factors grouped into five categories: demographic characteristics, level of knowledge, and values, attitudes and behaviors that consumers adopt towards environmental topics. Pihlstrom and Brush (2008) defined perceived value as "a multidimensional construct consisting of monetary, convenience, emotional, social, conditional, and epistemic value." They, therefore, divide functional value into two sub-constructs that are labeled monetary and convenience value. The conceptual research model proposed the convenience, emotional, and social value on (1) intentions to repurchase, (2) willingness to pay more (WTP), and (3) word of mouth (WOM). In addition, they suggest that conditional and epistemic value conceptualized as antecedents of the other value categories, and only indirectly influence intentions to repurchase, WOM behavior, and WTP through the value as mentioned above dimensions. The study of Salleh, Ali, Harun, Jalil, and Shaharudin (2010) attempted to gain knowledge about consumer attitude towards organic food product. A model illustrated the

relationship between psychographic variables (environmental concerns and health consciousness) and purchase intention of organic food products was proposed. Mostafa (2007) investigated the influence of various cultural values and psychological factors on the green purchase behavior of Egyptian consumers in his study. Drawing on research from North America, Australasia, and Europe, there is a wealth of evidence that suggests that a wide variety of factors influence pro-environmental behavior and, in turn, green purchase behavior. These characterized as environmental values, knowledge, concern, attitudes, and intention behaviors. The research of Manrai, A Manrai, Lasco, and Ryans (1997) addressed how the strength of a green claim, the consumer's attitude toward the country of origin of the automobile, interactively affected the product evaluation in terms of its greenness and company image was more favorable for consumers with highly positive country disposition.

### 2.2 Factors contributing green purchasing

#### 2.2.1Demographic

Although most findings of the impact of consumers' demographic characteristics on their environmentally conscious behavior are contradictory (Roberts, 1996, Laroche, Bergeron and Barbaro–Forleo, 2001), it is clear that they exert a significant influence. The demographic variables such as age and sex were significantly correlated with ecologically conscious consumer behavior when considered individually; and that income lacks significance (Chen and Chai, 2010). Green purchase intention correlates positively with every age and income except for education (Soonthonsmai, 2001; Chen and Chai, 2010). Many studies have shown significant differences between men and women in environmental attitudes (Brown and Harris, 1992; Tikka et al., 2000; Chen and Chai, 2010) with men having more negative attitudes towards the environment compared to women (Eagly, 1987; Tikka et al., 2000; Chen and Chai, 2010). Women were more likely to buy a green product because they believe the product was better for the environment (Mainieri et al., 1997; Chen and Chai, 2010). This contributed to the first hypothesis of this study. H1: there is a significant influence of demographic to green purchasing.

#### 2.2.2 Perceived Value

Values affect people's beliefs, which then have influences on personal norms that lead to consumers' pro-environmental behaviors (Reser and Bentrupperbaumer, 2005; Stern, 2000；Pickett-Baker and Ozaki, 2008). Perceived value is defined here as a multidimensional construct consisting of monetary, convenience, emotional, social, conditional, and epistemic

value (Pihlstrom and Brush, 2008). Monetary value denotes perceptions of good value for money or low price compared with alternatives (Sheth, Newman, & Gross, 1991; Pihlstrom and Brush, 2008). Convenience value represents the ease and speed of achieving a task effectively and efficiently, saving time and effort (Anderson & Srinivasan, 2003; Pihlstrom and Brush, 2008). Emotional value arises through fun, or enjoyable, service experiences (Pihlstrom and Brush, 2008). Social value is defined as the social approval or enhanced social self-concept generated by service use (Sweeney & Soutar, 2001, p. 211; Pihlstrom and Brush, 2008). This leads to the second hypothesis of this study. H2: there is a significant influence of perceived value to green purchasing.

### 2.2.3 Behavior

Green purchasing behavior refers to the consumption of products that are: benevolent/ beneficial to the environment; recyclable/conservable; or sensitive/responsive to ecological concerns (Mostafa, 2007). Suchard and Polonski (1991) stipulate that ecologically conscious consumers will try to protect the environment in different ways (e.g., recycling, checking that a package made of recycled material, purchasing only green products) (Laroche, Bergeron and Barbaro–Forleo, 2001). Most of the research on green consumers agrees that ecological behavior intention is strongly related to ecological behavior (Schahn & Holzer, 1990; Lansana, 1992; Mostafa, 2007) or at worst moderately related (Smythe & Brook, 1980; Mostafa, 2007). This contributed to the third hypothesis of this study. H3: there is a significant influence of behavior to green purchasing.

### 2.2.4 Psychographic

Psychographic is defined here as a two-dimensional construct consisting of environmental concerns and health consciousness. In general terms, environmental concern is a “concept that can refer to feelings [consumers have] about many different green issues” (Royne, Levey, and Martinez, 2011). In other words, it is a valid attribute that can represent a person’s worries, compassion, likes and dislikes about the environment (Lee, 2009). .According to Barber, Taylor, and Strick (2010), environmental concerns is considered as a continuum covering a wide range of cognitive and behavioral processes, and depending on their psychological stimuli, can be evoked differently. The health consciousness is a primary component of overall environmental concern. Because of the physical surrounding (air quality, water protect and even the availability of health care alternatives) directly affect human survival and quality of life (Royne, Levey, and Martinez, 2011), and individuals who practice environmental behaviors will promote healthier communities, via improved quality of air, water and physical health (Royne,

Levey, and Martinez, 2011). This contributed to the fourth hypothesis of this study. H4: there is a significant influence of psychographic to green purchasing.

### 2.2.5 Environmental Knowledge

Environmental knowledge can be defined as "general knowledge of facts, concepts, and relationships concerning the natural environment and its major ecosystems" (Mostafa, 2007). Indeed, knowledge recognized in consumer research as a characteristic that influences all phases in the decision process. Specifically, knowledge is a relevant and significant construct that affects how consumers gather and organization information (Alba and Hutchinson, 1987, Laroche, Bergeron and Barbaro–Forleo, 2001). On the balance of all the previous empirical results, it appears that the general perspective that a positive relationship between environmental knowledge and behavior exists still prevails (Mostafa, 2007). When considering the environment, increased knowledge is assumed to change environmental attitudes, and both environmental knowledge and attitudes are thought to influence environmental behavior (Fraj and Martinez, 2006). This contributed to the fifth hypothesis of this study. H5: there is a significant influence of environmental knowledge to green purchasing.

### 2.2.6 Green Purchase Attitude

The social psychology literature on behavioral research has established attitudes as significant predictors of behavior, behavioral intention, and explanatory factors of variants in individual behavior (Mostafa, 2007). An individual's perception of the severity of ecological problems might influence his/her willingness to pay more for an ecologically compatible product (Laroche, Bergeron, and Barbaro–Forleo, 2001). Consumer attitudes have also been used in past studies to predict energy conservation and ecologically conscious purchase and use of products. Product purchasing decisions are often based on their environmental attitudes (Chen and Chai, 2010). This contributed to the sixth hypothesis of this study. H6: there is a significant influence of green purchase attitude to green purchasing.

## 3. Methodology

Initially, this research described the green purchasing development and challenge on real estate industry in San Francisco Bay Area. Secondly, reviewed works literatures on green marketing factors that influence the customer in green purchasing and the green building products for house building and upgrade. Thirdly, outlines a conceptual model and delineates statistical methods for data analyses. Then, present the results of hypothesis test. In the end, holds the conclusion, implications, limitations and suggestions for future research. Figure 1

summarized the research process of the present study.

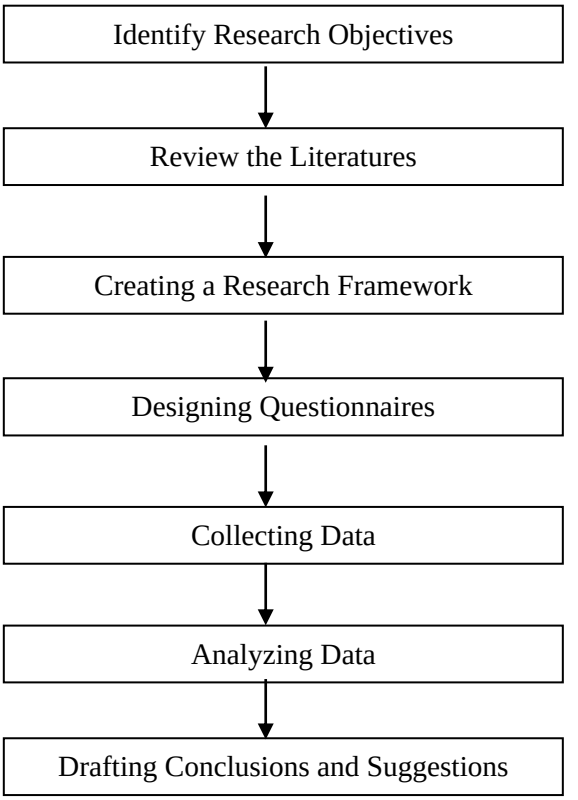


Figure 1. Research Processes of the Present Study

A conceptual model has been proposed and subjected to empirical verification with the use of a survey of randomly selected households who willing to upgrade their houses in the San Francisco Bay Area. Using various statistical analyses, investigates the demographic, psychological, environmental knowledge, and green products evaluation, perceived value and behavioral profiles of consumers who have the intention to purchase green products, or in other words, willingness to pay more for environmentally friendly products. The data of this study will be analyzed by multiple regression and ANOVA. The expected finding is that the result may indicate that various factors have a positive relationship to green purchasing intention. The research questions are: (1)What kind of factors may influence the households to pay a premium for green building in the San Francisco Bay Area? and (2) Who is likely to pay more for environmentally friendly products on the Real Estate Industry in San Francisco Bay Area?

A variables summary provided in Table 1. It concludes all variables that will show on proposed framework in this study.

Table 1. Factors contributed to green purchasing
(independent variables and dependent variables)

| IVs/DVs | Factors | Variables | References |
|---|---|---|---|
| IVs | Factor 1: Demographics | 1. Age<br>2. Gender<br>3. Income<br>4. Level of education<br>5. Employment status<br>6. Home ownership<br>7. Martial status<br>8. Family size | Laroche, Bergeron and Barbaro–Forleo (2001) |
| | Factor 2: Perceived Value | *1. Monetary value*<br>*2. Convenience value*<br>*3. Emotional value*<br>*4. Social value* | Pihlstrom and Brush (2008) |
| | Factor 3: Behavior | 1. Considering environmental issues when making a purchase<br>2. Recycling<br>3. Buying environmentally friendly products | Laroche, Bergeron and Barbaro–Forleo (2001) |
| | Factor 4: Psychographic | 1. Environmental Concerns<br>2. Health Consciousness | Salleh, Ali, Harun, Jalil, and Shaharudin (2010) |
| | Factor 5: Environmental Knowledge | 1. Products and packages<br>2. Recycling<br>3. Reduce the amount of waste | Mostafa (2007) |

| | | | |
|---|---|---|---|
| DVs | Factor 6: Green Purchase Attitude | 1. Importance of being environmentally friendly<br>2. Inconvenience of being environmentally friendly<br>3. Severity of environmental problems<br>4. Level of responsibility corporations | Laroche, Bergeron and Barbaro–Forleo (2001) |
| | Factor 7: Green Purchase Intention/ Willingness to pay more for green products | 1. Buying less polluting products<br>2. Switching to other brands for ecological reason<br>3. Switch to a green version of a product | Mostafa (2007) |

Green building materials are composed of renewable, rather than nonrenewable resources. Green materials are environmentally responsible because impacts considered over the life of the product (CalRecycle). The National Association of the Remodeling Industry claims that green remodeling can be done in small ways and doesn't necessarily have to encompass the entire home. It's easy to pick and choose elements that fit each particular homeowner in Table 2.

Table 2. List of Green Building Products

| |
|---|
| Non-toxic paints and sealants |
| Programmable thermostats |
| Energy efficient appliances |
| Natural flooring |
| Local building materials |
| Natural fiber rugs and fabrics |
| Recycled material roof shingles and tiles |
| Energy efficient lighting |
| Insulated hot water pipes |
| Tankless water heaters |
| Quality insulation |
| Native plants for landscaping |

According to Froeschle (1999), Table 3 recommended environmental material criteria for use in green building product or system assessment and evaluation. It also has been used by CalRecycle, the Department of Resources Recycling and Recovery of California, as green material criteria.

Table 3. Environmental Material Criteria for Use in Green Building Product

| |
|---|
| **Resource efficiency** can be accomplished by utilizing materials that meet the following criteria:<br>*Recycled Content*: Products with identifiable recycled content, including postindustrial content with a preference for postconsumer content.<br>*Natural, plentiful or renewable*: Materials harvested from sustainably managed sources and preferably have an independent certification (e.g., certified wood) and are certified by an independent third party.<br>*Resource efficient manufacturing process*: Products manufactured with resource-efficient processes including reducing energy consumption, minimizing waste (recycled, recyclable and or source reduced product packaging), and reducing greenhouse gases.<br>*Locally available*: Building materials, components, and systems found locally or regionally saving energy and resources in transportation to the project site.<br>*Salvaged, refurbished, or remanufactured*: Includes saving a material from disposal and renovating, repairing, restoring, or generally improving the appearance, performance, quality, functionality, or value of a product.<br>*Reusable or recyclable*: Select materials that can be easily dismantled and reused or recycled at the end of their useful life.<br>*Recycled or recyclable product packaging*: Products enclosed in recycled content or recyclable packaging.<br>*Durable*: Materials that are longer lasting or are comparable to conventional products with long life expectancies. |
| **Indoor Air Quality (IAQ)** is enhanced by utilizing materials that meet the following criteria:<br>*Low or non-toxic*: Materials that emit few or no carcinogens, reproductive toxicants, or irritants as demonstrated by the manufacturer through appropriate testing.<br>*Minimal chemical emissions*: Products that have minimal emissions of Volatile Organic Compounds (VOCs). Products that also maximize resource and energy efficiency while reducing chemical emissions.<br>*Low-VOC assembly*: Materials installed with minimal VOC-producing compounds, or |

| |
|---|
| no-VOC mechanical attachment methods and minimal hazards.<br>*Moisture resistant*: Products and systems that resist moisture or inhibit the growth of biological contaminants in buildings.<br>*Healthfully maintained*: Materials, components, and systems that require only simple, non-toxic, or low-VOC methods of cleaning.<br>*Systems or equipment***:** Products that promote healthy IAQ by identifying indoor air pollutants or enhancing the air quality. |
| **Energy Efficiency** can be maximized by utilizing materials and systems that meet the following criteria:<br>Materials, components, and systems that help reduce energy consumption in buildings and facilities |
| **Water Conservation** can be obtained by utilizing materials and systems that meet the following criteria:<br>Products and systems that help reduce water consumption in buildings and conserve water in landscaped areas. |

Following an exhaustive review of the relevant literature, several factors found that may influence consumers' green purchase intention, or in other word, pay premiums for green products. These factors classified into seven categories: demographics, psychographics, product evaluation, perceived value, environmental knowledge, attitudes, and behavior. Figure 2 proposes a theoretical framework for these factors.

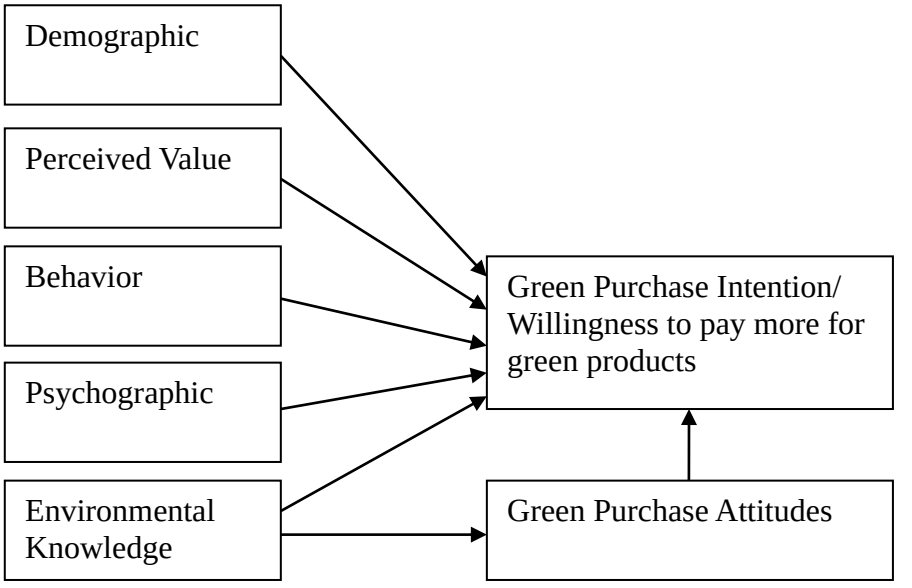


Figure 2. A Conceptual Framework for the Present Study.

# 4. Conclusions

In today's world of climate change and high energy prices, it is critical that buildings use as less energy as possible to against unpredictable and rapidly rising prices. Besides, to save energy, a green home will cost less to operate, be healthier, last longer, and have less impact on the environment. This study examined the different variables contributing to the green purchasing on the Real Estate Industry in San Francisco Bay Area that enables organizations to arrive at appropriate strategic decisions to capture the emerging green customer. It acknowledged that the market for real estate is awful since the financial crisis of 2007. Home values dropped 1.9 percent in January 2011 from the month before and were down 1.7 percent year over year, according to the latest Standard & Poor's/Case-Shiller home price report. "The housing market recession is not yet over, and none of the statistics are indicating any form of sustained recovery, "David M. Blitzer, chairman of S&P's index committee. Because of the serious decrease on new home building situation, many companies start to help homeowners make upgrades to their home. According to the Harvard Joint Center for Housing Studies, more than 120 million homes are at least 32 years old, and $233 billion is spent annually on remodeling them. Those older houses built when energy was cheap, so they have few of the features that are featured in new green construction. The average home today utilizes systems for heating, ventilation, and air conditioning, and most homes are not built as efficiently as they could be, all of which result in high energy consumption. The U.S. Department of Energy believes once current buildings were green-improved, they would use $20 billion less energy per year. A significant challenge facing for these marketers is to identify which consumers are willing to pay a premium for green building.

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# Influence of Transformational Leadership on Green Supply Chain Management: A case of Food and Beverage Business in Pathumthani Province

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## Abstract

With the importance of green supply chain management affecting the business performance, many organizations are attempting to find the way to increase their employees' awareness on related issues which one of them is associated with leadership in the organizations. Therefore, the study of "Influence of Transformational Leadership on Green Supply Chain Management: A case of Food and Beverage Business in Pathumthani Province" had been conducted. The objectives of this research were to 1) study about the employee's demographical characteristics, transformational leadership and green supply chain management; 2) compare the degree of transformational leadership categorized by employee's demographical characteristics; 3) compare the degree of green supply chain management categorized by employee's demographical characteristics and 4) investigate the influence of transformational leadership on green supply chain management in Food and Beverage Business in Pathumthani Province. The data was collected from 400 from managerial and operational employees who were working about green supply chain management activities in the food and beverage firms, located in Pathumthani province, Thailand. The data analysis used frequency, percentage, mean, standard deviation, independent sample T-test, One-way ANOVA, multiple regression model analysis with all enter method at the statistically significant level of 0.05.

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The result revealed that most of the respondents were male (53.0%), aged between 21-30 years old (50.8%), were single (70.3%), graduated from Bachelor's degree (64.3%), worked as operational employees (49.8%), earned income more than 30,001 (40%) and experienced working for more than 5 years (53.5%). The findings also indicated that employees had opinion towards transformational leadership (inspiration motivation, charisma leadership, intellectual stimulation and individualized consideration) in low level. The hypothesis testing revealed that employees with different age and education had different transformational leadership; meanwhile, employees with different gender, age and education had different green supply chain management. In addition, the transformational leadership including inspiration motivation ($\beta = 0.353$), idealistic leadership ($\beta = 0.280$), individualized consideration ($\beta = 0.212$) and intellectual stimulation ($\beta = 0.142$), positively influenced green supply chain management at the significant level as of .000.

**Keywords:** Demographical Characteristics, Transformational Leadership, Green Supply Chain Management, Food and Beverage Firms, Pathumthani Province.

# 1. Introduction

Green supply chain management is the connection of production components and procurement procedures, starting from the procurement of raw materials to the provision of products or services to users and integration with considering the environmental impacts (Scott and Westbrook, 1991). Green supply chain activities can include green procurement, green materials and production management, green distribution and marketing, green design and green logistics (Scott and Westbrook, 1991). Recently, green supply chain management is very crucial to the organization since it can increase customer satisfaction (Chavez, Yu, Feng, & Wiengarten, 2016), business performance (Green Jr, Zelbst, Meacham, & Bhadauria, 2012), sustainability performance (Chin, Tat, & Sulaiman, 2015), environmental and financial performance (Laari, Töyli, Solakivi, & Ojala, 2016), corporate reputation (Hoejmose, Roehrich, & Grosvold, 2014). Indeed, many organizations attempted to adopt the green supply chain management in the organization. However, they have encountered the difficulty of adoption such as lack of business partners' collaboration, lack of government supports, lack of technical and technological expertise and knowledge, lack of financial availability, lack of internal employees' collaboration, lack of organizational and managerial involvements and so forth (Govindan, Kaliyan, Kannan, & Haq, 2014; Ghazilla et al, 2015; Rauer, J., & Kaufmann, 2015). To overcome constrains, the managerial involvement with effective leadership style should be involved.

One of leadership styles that can be recognized is the transformational leadership. This leadership refers to a leading person who can change the beliefs and attitudes of the fellow employees to conform the work upon the set goal. This kind of leader can convey the ideas and experiences, and stimulate various ideas for the followers continuously and systematically (Burn, 1978 and Bass 1985). There many studies revealed that the transformational leadership can have influence on job satisfaction (Alghamdi, Topp & AlYami, 2018), employee productivity (Vatankhah et al., 2017), workplace relationships and job performance (Li, & Hung, 2009), organizational citizenship behavior (Wang, Law, Hackett, Wang, & Chen, 2005), quality management practices (Rehan, Khan, & Khan, 2016) and organizational performance (Garcia-Morales, Matias-Reche, & Hurtado-Torres, 2008). However, in order to adopt the transformational leadership into the management, the organization needs to understand the factors that can influence such transformational leadership. Most of the researchers emphasized

on demographical and social characteristics including gender, age, marital status, education, nationality, occupational position, income, working duration in the organization can also influence employee's leadership (Carless, 1998; Kent, Blair, Rudd, & Schuele, 2010; Mohammed, Othman, & D'Silva, 2012; Rehan, Khan, & Khan, 2016; Alenazi, Muenjohn, & McMurray, 2017). Although there are various researchers focusing on demographical and social characteristics, they are still interesting to be studied since there are still the area to repeatedly oversee these factors, the different area and nature of organization requires the different desired leadership for such organization.

In align with this, the researchers are interested in studying the influence of transformational leadership on green supply chain management: a case of food and beverage business in Pathumthani Province. This study can provide the guidance of adopting the transformational leadership to better the green supply chain management in the food and beverage business in Pathumthani Province. The increase in better green supply chain management can result in the customer satisfaction, business performance, finical performance and corporate reputation.

## 2. Objectives

According to the study of "Influence of Transformational Leadership on Green Supply Chain Management: A case of Food and Beverage Business in Pathumthani Province", the researchers set the objectives as follows:

1) To study about the employee's demographical characteristics, employees' opinion towards transformational leadership and employees' opinion towards green supply chain management
2) To compare the employee's opinion towards transformational leadership categorized by employee's demographical characteristics
3) To compare the employee's opinion towards green supply chain management categorized by employee's demographical characteristics
4) To investigate the influence of transformational leadership on green supply chain management in Food and Beverage Business in Pathumthani Province.

**Conceptual Framework**

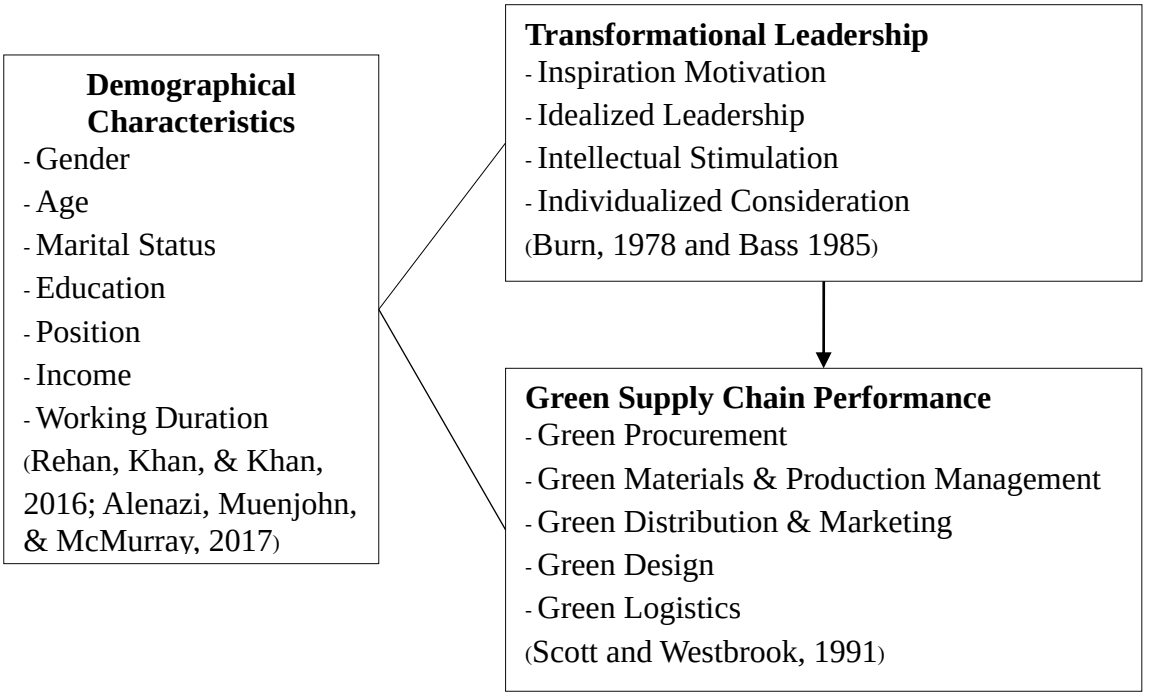


Figure 1**:** Conceptual Framework

# 3. Hypotheses

1) Employees with different demographical characteristics have different opinion towards transformational leadership in food and beverage business in Pathumthani Province.
2) Employees with different demographical characteristics have different opinion towards green supply chain management in food and beverage business in Pathumthani Province.
3) Transformational leadership has a positive effect on green supply chain management in food and beverage business in Pathumthani Province.

# 4. Literature Reviews

**Transformational leadership**

Transformational leadership refers to a leading person who has the characteristics of being able to change beliefs and attitudes of the followers so that they can work beyond the set goal. Indeed, the leaders need to convey ideas, have experiences and stimulate various ideas for the followers continuously and systematically (Burn, 1978 and Bass 1985). Transformational leadership can divided into 4 dimensions including inspiration motivation, idealized influence,

intellectual stimulation and individualized consideration. Firstly, the inspiration motivation refers to the characteristics motivating employees by their own enthusiasm, confidence and achievable possibilities. The leaders with this characteristic will not only use their power on their followers, but they also directly and effectively translate their own enthusiasm to followers. Secondly, the idealized influence refers to someone's characteristics which are able to inspire respect and higher order motivation in the followers as well as to have a clear set of idealized qualities shown to the followers. Thirdly, the intellectual stimulation refers to the characteristics providing intellectual stimulation to followers by fostering the development of creative solutions to problems aligning with organizational goal attainment, beliefs and values. Lastly, the individualized consideration refers to someone's leadership style focusing on the achievement obtained by the full potential via a close consideration of their developmental needs (Yammarino & Bass, 1990; Yammarino, Spangler & Bass, 1993; Bass & Avolio, 1995; House, 1977; Panopoulos, 1999). The transformational leadership has played an important role in the organization due to the fact that it can influence job satisfaction (Alghamdi, Topp & AlYami, 2018), employee productivity in work ability, clarity, help, assessment, validity, motivation and environment (Vatankhah et al., 2017), workplace relationships and job performance (Li, & Hung, 2009), organizational identification on intrapreneurship (Moriano, Molero, Topa, & Mangin, 2014), organizational citizenship behavior (Wang, Law, Hackett, Wang, & Chen, 2005), quality management practices (Rehan, Khan, & Khan, 2016), organizational innovation and performance (Garcia-Morales, Matias-Reche, & Hurtado-Torres, 2008). Many organizations attempted to adopt transformational leadership into their organization. In terms of green supply chain management including green procurement, green materials and production management, green distribution and marketing, green design and green logistics in the organization (Scott & Westbrook, 1991), there are various organizations attempting to understand employee's transformational leadership and utilize it to increase the effective adoption of the management (Chen, Chang, & Lin, 2014); Wang, & Cruz, 2018). To have the effective transformational leadership, there are various factors the organization is necessary to consider; for instances, demographical and social characteristics including gender, age, marital status, educational level, nationality, occupational position, monthly income, and working duration in the organization. This indeed can influence employee's leadership (Carless,

1998; Kent, Blair, Rudd, & Schuele, 2010; Mohammed, Othman, & D'Silva, 2012; Rehan, Khan, & Khan, 2016; Alenazi, Muenjohn, & McMurray, 2017). However, the factors affecting the transformational leadership are vary upon the different area and nature of organization. Therefore, this study emphasized on what factors can influence the transformational leadership in food and beverage business in Pathumthani Province.

**Green supply chain management**

Green supply chain management is the connection of production components and procurement procedures, starting from the procurement of raw materials to the provision of products or services to users and integration. In management of related companies in the supply chain, the organization will have to run business activities and consider the environment and strategies to greener the supply chain (Scott and Westbrook, 1991). The green supply chain management activities include green procurement, green materials and production management, green distribution and marketing, green design and green logistics. Green procurement refers to the procurement of goods and services that have less environmental impact compared to similar products and services. Green materials and production management refers to the management of raw materials and production using environmentally friendly technologies with the consideration of having the most cost-effective production factors in order to increase efficiency and profitability and reduce environmental impacts. Green distribution and marketing refers to the marketing and distribution of products and services that take the environmental factors into account of the company such as packaging methods, distribution and communication with customers. Green design or eco-design refers to the product design that focuses on green or eco-friendly purposes; for example, the product is designed by using environmental-friendly raw material, the product is designed to be transported without harming the environment, the product is designed to support the customers to use environmental-friendly products, or the product is designed to be returned for the recycling or landfill process. Lastly, green logistics refers to the conveying of products or materials with regard to the environment. The green supply chain management has significant role in increasing customer satisfaction (Chavez, Yu, Feng, & Wiengarten, 2016), business performance (Green Jr, Zelbst, Meacham, & Bhadauria, 2012), sustainability performance (Chin, Tat, & Sulaiman, 2015), environmental and financial performance (Laari, Töyli, Solakivi, & Ojala, 2016), corporate reputation (Hoejmose, Roehrich,

& Grosvold, 2014). Many organizations began to adopt the green supply chain management; however, they have encountered the difficulty of adoption because there are many factors behind such as problems and complexity in suppliers and business partners' collaboration, lack of government supports, lack of proper training/reward system for suppliers, employees and other related stakeholders, lack of technical and technological expertise, lack of new technology, materials and processes, lack of environmental knowledge, high investments and less return-on-investments, lack of bank loans availability, lack of financial supports, lack of customer and other stakeholders' awareness, lack of information exchange, lack of managerial involvements, lack of adequate management capacity and others (Govindan, Kaliyan, Kannan, & Haq, 2014; Ghazilla et al, 2015; Rauer, J., & Kaufmann, 2015; Pham & Pham, 2017). To overwhelming such constrains, the managerial involvement with effective leadership style should be involved since the leadership can have influence on effective organizational management (Li, & Hung, 2009; Rehan, Khan, & Khan, 2016).

# 5. Research Methodology

In terms of population and samples, the researchers selected 400 employees who are working in the food and beverage business in Pathumthani Province, Thailand, by using Krejcie, & Morgan (1970). The food and beverage business in Pathumthani Province, Thailand, selected in this study, must be working with environmental concerns or certified by the Green Industry Certificate given by the Green Industry, Thailand Environment Institute.

In terms of research tools and data collection, the researchers used close-ended questionnaires consisting of 3 parts. The first part consisted of check-list questions asking about the demographical factors including gender, age, marital status, educational level, position, monthly income, and working duration. The second and third parts consisted of five rating scale questions (1-5 Likert scale) asking about transformational leadership (inspiration motivation, idealized influence, intellectual stimulation and individualized consideration) and green supply chain management (green procurement, green materials and production management, green distribution and marketing, green design and green logistics). The five-rating scale included 1 referring to "not at all agreeable", 2 referring to "slightly agreeable", 3 referring to "moderately agreeable", 4 referring to "highly agreeable" and 5 referring to "extremely agreeable". The convenience sampling was employed to gain the data collection.

In terms of validity and reliability, the researchers had three experts in related fields considered the contents accurateness and consistency by using Item-Objective Congruence Index (IOC). The score was reported higher than 0.70. For reliability check, the researchers used Cronbach's alpha coefficient. The findings indicated that the Cronbach's alpha coefficient of inspiration motivation, idealized influence, intellectual stimulation and individualized consideration was preferably equal to 0.840, 0.796, 0.817, and 0.840, respectively. Also, the Cronbach's alpha coefficient of green procurement, green materials and production management, green distribution and marketing, green design and green logistics was preferably equal to 0.810, 0.851, 0.810, 0.918, and 0.928, respectively. These values were acceptable as recommendation (Hajiar, 2014). This can mean that the data derived from this survey questionnaire can be proceeded to further study.

In data analysis, the researchers analyzed the data derived from samples by using descriptive statistics including frequency and percentage to study demographical factors, and mean and standard deviation to study the opinion of employees towards transformational leadership and green supply chain management. The interpretation regarding the employees' opinion was shown in Table 1, according to Best & Kahn (2006). Also, the researchers employed inferential statistics including independent sample T-test, One-way ANOVA, multiple regression model analysis with all-enter method at the statistically significant level of 0.05 to investigate the hypotheses.

Table 1**:** Opinion Degree Interpretation, Calculated as to be **(**5-1**)**/5=0**.**80

| **Range of Mean** | **Interpretation** |
|---|---|
| Between 1.00 - 1.80 | Employee does not at all agree with the statement. |
| Between 1.81 - 2.60 | Employee slightly agrees with the statement. |
| Between 2.61 - 3.40 | Employee moderately agrees with the statement. |
| Between 3.41 – 4.20 | Employee highly agrees with the statement. |
| Between 4.20 – 5.00 | Employee extremely agrees with the statement. |

# 6. Results

**Study of Demographical Factors**

Table 2**:** Frequency and percentage of demographical factors

| **Demographical Factors** | **Persons** | **Percent** |
|---|---|---|
| **Gender** | | |
| Male | 212 | 53.0 |

| Demographical Factors | Persons | Percent |
|---|---|---|
| Female | 188 | 47.0 |
| **Age** | | |
| Lower than 20 years old | 6 | 1.5 |
| Between 21 – 30 years old | 203 | 50.8 |
| Between 31 – 40 years old | 135 | 33.8 |
| Between 41 – 50 years old | 46 | 11.5 |
| Higher than 50 years old | 10 | 2.5 |
| **Marital Status** | | |
| Single | 281 | 70.3 |
| Married | 101 | 25.3 |
| Divorced | 18 | 4.5 |
| **Educational Level** | | |
| Lower than Bachelor's degree | 55 | 13.8 |
| Bachelor's degree | 257 | 64.3 |
| Master's degree | 78 | 19.5 |
| Higher than Master's degree | 10 | 2.5 |
| **Position** | | |
| Executive | 70 | 17.5 |
| Manager | 5 | 1.3 |
| Head of department/ division | 81 | 20.3 |
| Head of project, team | 45 | 11.3 |
| Operational staff | 199 | 49.8 |
| **Monthly Income** | | |
| Lower than 15,000 baht | 66 | 16.5 |
| 15,001 - 20,000 baht | 74 | 18.5 |
| 20,001 - 25,000 baht | 62 | 15.5 |
| 25,001 - 30,000 baht | 38 | 9.5 |
| Higher than 30,001 baht | 160 | 40.0 |
| **Working Duration** | | |
| Lower than 1 year | 35 | 8.8 |
| 1 – 2 years | 62 | 15.5 |
| 3 – 5 years | 89 | 22.3 |
| Higher than 5 years | 214 | 53.5 |
| **Total** | **400** | **100.0** |

The Table 2 showed that most of them the respondents were female, aged between 21 – 30 years old, were single, graduated from bachelor's degree, worked as operational staff, earned higher than 30,001 baht and worked for higher than 5 years.

**Study of Transformational Leadership**

Table 3**:** Frequency and percentage of transformational leadership

| **Transformational Leadership** | $\bar{X}$ | **Std. Deviation** | **Interpretation** |
|---|---|---|---|
| Idealised influence | 2.66 | 1.01 | Moderately |
| Inspiration Motivation | 2.44 | 0.80 | Slightly |
| Intellectual Stimulation | 2.67 | 0.95 | Moderately |
| Individualized Consideration | 2.42 | 0.87 | Slightly |
| **Overall** | **2.45** | **0.82** | **Slightly** |

The Table 3 showed that the employees had opinion towards transformational leadership in the "slightly" level ($\bar{X}$= 2.45, S.D. = 0.82). When considering into each dimension, the employees had mostly opinion towards intellectual stimulation ($\bar{X}$= 2.67, S.D. = 0.95), followed by idealized influence ($\bar{X}$= 2.66, S.D. = 1.01), inspiration motivation ($\bar{X}$= 2.44, S.D. = 0.80) and individualized consideration ($\bar{X}$= 2.42, S.D. = 0.87), respectively.

**Study of Green Supply Chain Management**

Table 4**:** Frequency and percentage of green supply chain management

| **Green Supply Chain Management** | $\bar{X}$ | **Std. Deviation** | **Interpretation** |
|---|---|---|---|
| Green Procurement | 2.51 | 0.93 | Slightly |
| Green Materials and Production Management | 2.45 | 0.86 | Slightly |
| Green Distribution and Marketing | 2.45 | 0.92 | Slightly |
| Green Design | 2.32 | 0.92 | Slightly |
| Green Logistics | 2.49 | 1.06 | Slightly |
| **Overall** | **2.36** | **0.79** | **Slightly** |

The Table 4 showed that the employees had opinion towards transformational leadership in the "slightly" level ($\bar{X}$ = 2.36, S.D. = 0.79). When considering into each dimension, the employees had mostly opinion towards green procurement ($\bar{X}$ = 2.51, S.D. = 0.93), followed by green distribution and marketing ($\bar{X}$ = 2.49, S.D. = 1.06), green materials and production management ($\bar{X}$ = 2.45, S.D. = 0.86), green distribution and marketing ($\bar{X}$ = 2.45, S.D. = 0.92), and green design ($\bar{X}$ = 2.32, S.D. = 0.92), respectively.

**Hypotheses Testing**

**Hypothesis 1**: **Employees with different demographical characteristics have different opinion towards transformational leadership in food and beverage business in Pathumthani Province**.

Table 5**:** Mean comparison of transformational leadership categorized by demographical factors

| Demographical Factors | Transformational Leadership | | |
|---|---|---|---|
| | **Sig.** | **Value** | **Interpretation** |
| Gender | 0.891 | t = 0.137 | Reject |
| Age | 0.006 | F = 3.719 | Accept |
| Marital Status | 0.287 | F = 1.253 | Reject |
| Educational Level | 0.001 | F = 5.324 | Accept |
| Position | 0.739 | F = 0.495 | Reject |
| Monthly Income | 0.336 | F = 1.143 | Reject |
| Working Duration | 0.322 | F = 1.166 | Reject |

The Table 5 showed that employees with different age (Sig. = 0.006, F = 3.719) and educational level (Sig. = 0.001, F = 5.324) have different opinion towards transformational leadership in food and beverage business in Pathumthani Province. In the meantime, employees with different gender (Sig. = 0.891, t = 0.137), marital status (Sig. = 0.287, F = 1.253), position (Sig. = 0.739, F = 0.495), monthly income (Sig. = 0.336, F = 1.143) and working duration (Sig. = 0.322, F = 1.166) do not have different opinion towards transformational leadership in food and beverage business in Pathumthani Province at the statistically significant level as of 0.05.

In this study, the least significant difference (LSD) was performed with the purpose of testing the pair difference of transformational leadership categorized by age and education.

Table 6**:** Multiple comparisons of transformational leadership categorized by age

| **Age (Years Old)** | | **Transformational Leadership** | | | | |
|---|---|---|---|---|---|---|
| | | **Mean Difference (I-J)** | | | | |
| | | **≤20** | **21 – 30** | **31 – 40** | **41 – 50** | **50 ≥** |
| (I-J) | $\bar{X}$ | 3.50 | 2.50 | 2.33 | 2.37 | 2.70 |
| ≤20 | 3.50 | - | 1.003* | 1.167* | 1.130* | 0.800 |
| 21 – 30 | 2.50 | | - | 0.164 | 0.128 | -0.203 |
| 31 – 40 | 2.33 | | | - | -0.036 | -0.367 |
| 41 – 50 | 2.37 | | | | - | -0.330 |
| 50 ≥ | 2.70 | | | | | - |

Remark: * = The mean difference is significant at the 0.05 level

The Table 6 showed that employees with age lower than 20 years old agreed more on opinion towards transformational leadership than employees with age between 21 – 30 years old, between 31 – 40 years old and between 41 – 50 years old at the statistically significant level as of 0.05.

Table 7**:** Multiple comparisons of transformational leadership categorized by education

| **Education** | | **Transformational Leadership** | | | |
|---|---|---|---|---|---|
| | | **Mean Difference (I-J)** | | | |
| | | **≤ Bachelor's degree** | **Bachelor's degree** | **Master's degree** | **Master's degree ≥** |
| (I-J) | $\bar{X}$ | 2.84 | 2.37 | 2.46 | 2.20 |
| ≤ Bachelor's degree | 2.84 | - | 0.467* | 0.375* | 0.636* |
| Bachelor's degree | 2.37 | | - | -0.092 | 0.170 |
| Master's degree | 2.46 | | | - | 0.262 |
| Master's degree ≥ | 2.20 | | | | - |

Remark: * = The mean difference is significant at the 0.05 level

The Table 7 showed that employees with lower than bachelor's degree agreed more on opinion towards transformational leadership than employees with bachelor's degree, master's degree and higher than master's degree at the statistically significant level as of 0.05.

**Hypothesis 2**: **Employees with different demographical characteristics have different opinion towards green supply chain management in food and beverage business in Pathumthani Province**.

Table 8**:** Mean comparison of green supply chain management categorized by demographical factors

| **Demographical Factors** | **Green Supply Chain Management** | | |
|---|---|---|---|
| | **Sig.** | **Value** | **Interpretation** |
| Gender | 0.979 | t = 0.027 | Reject |
| Age | 0.003 | F = 4.007 | Accept |
| Marital Status | 0.218 | F = 1.529 | Reject |
| Educational Level | 0.000 | F = 7.355 | Accept |
| Position | 0.524 | F = 0.802 | Reject |
| Monthly Income | 0.260 | F = 1.326 | Reject |
| Working Duration | 0.177 | F = 1.654 | Reject |

Table 8 showed that employees with different age (Sig. = 0.003, F = 4.007) and educational level (Sig. = 0.000, F = 7.355) have different opinion towards green supply chain management in food and beverage business in Pathumthani Province. In the meantime, employees with different gender (Sig. = 0.979, t = 0.027), marital status (Sig. = 0.218, F = 1.529), position (Sig. = 0.524, F = 0.802), monthly income (Sig. = 0.260, F = 1.326) and working duration (Sig. = 0.177, F = 1.654) do not have different opinion towards green supply chain management in food and beverage business in Pathumthani Province at the statistically significant level as of 0.05.

In this study, the least significant difference (LSD) was performed with the purpose of

testing the pair difference of green supply chain management categorized by age and education.

Table 9**:** Multiple comparisons of green supply chain management categorized by age

| Age | | Green Supply Chain Management | | | | |
|---|---|---|---|---|---|---|
| | | Mean Difference (I-J) | | | | |
| | | **≤20** | **21 – 30** | **31 – 40** | **41 – 50** | **50 ≥** |
| **(I-J)** | **Mean** | **3.50** | **2.38** | **2.30** | **2.24** | **2.60** |
| ≤20 | 3.50 | - | 1.121* | 1.204* | 1.261* | 0.900* |
| 21 – 30 | 2.38 | | - | 0.083 | 0.140 | -0.221 |
| 31 – 40 | 2.30 | | | - | 0.057 | -0.304 |
| 41 – 50 | 2.24 | | | | - | -0.361 |
| 50 ≥ | 2.60 | | | | | - |

Remark: * = The mean difference is significant at the 0.05 level

The Table 9 showed that employees with age lower than 20 years old agreed more on opinion towards green supply chain management than employees with age between 21 – 30 years old, between 31 – 40 years old and between 41 – 50 years old at the statistically significant level as of 0.05.

Table 10**:** Multiple comparisons of green supply chain management categorized by education

| Education | | Green Supply Chain Management | | | |
|---|---|---|---|---|---|
| | | Mean Difference (I-J) | | | |
| | | **≤ Bachelor's degree** | **Bachelor's degree** | **Master's degree** | **Master's degree ≥** |
| **(I-J)** | **Mean** | **2.78** | **2.30** | **2.32** | **1.90** |
| ≤ Bachelor's degree | 2.78 | - | 0.486* | 0.461* | 0.882* |
| Bachelor's degree | 2.30 | | - | -0.025 | 0.396 |
| Master's degree | 2.32 | | | - | 0.421 |
| Master's degree ≥ | 1.90 | | | | - |

Remark: * = The mean difference is significant at the 0.05 level

The Table 10 showed that employees with lower than bachelor's degree agreed more on opinion towards green supply chain management than employees with bachelor's degree, master's degree and higher than master's degree at the statistically significant level as of 0.05.

**Hypothesis 3**: **Transformational leadership has a positive effect on green supply chain management in Food and Beverage Business in Pathumthani Province**.

Table 11**:** All-enter multiple regression model analysis of transformational leadership on green supply chain management

| Transformational Leadership | Green Supply Chain Management | | | | |
|---|---|---|---|---|---|
| | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. |
| | B | Std. Error | Beta | | |
| (Constant) | 0.156 | 0.069 | | 2.268 | 0.024 |
| Inspiration Motivation | 0.346 | 0.058 | 0.353 | 5.988 | 0.000 |
| Idealized Influence | 0.219 | 0.028 | 0.280 | 7.903 | 0.000 |
| Individualized Consideration | 0.191 | 0.047 | 0.212 | 4.070 | 0.000 |
| Intellectual Stimulation | 0.118 | 0.028 | 0.142 | 4.164 | 0.000 |
| R = 0.864; Adjusted $R^2$ = 0.744; SEE = 0.399; F = 290.491; p-value = 0.000; Tolerance = 0.185 – 0.550; VIF = 1.817 – 5.406 | | | | | |

From the Table 11, after using all-enter multiple regression model to explore the most appropriate values for model prediction, the result indicated that there are four variables including inspiration motivation, idealized influence, individualized consideration and intellectual stimulation that have an effect on the green supply chain management at the significant level as of 0.05.

Overall, the model has correlation coefficient (r) as of 0.864. The adjusted $R^2$ was as of 0.744, meaning that the model can accurately predict the green supply chain management as of 74.4%. In addition, the model has standardized coefficients (β) ranging from 0.142 to 0.353. Align with these values, the inspiration motivation can most significantly affect the green supply chain management with weight as of 0.353, or accounted for 35.3%. Then, it was followed by the idealized influence with weight as of 0.280, or accounted for 28.0%; individualized consideration with weight as of 0.212, or accounted for 21.2% and intellectual stimulation with weight as of 0.142, or accounted for 14.2%. Consequently, the model can generate the equation with unstandardized coefficients as follow:

$$Y = 0.156 + 0.346\ (\text{Inspiration Motivation}) + 0.219(\text{Idealized Influence}) + 0.191(\text{Individualized Consideration}) + 0.118(\text{Intellectual Stimulation})$$

# 7. Conclusion and Discussion

From the study, it was found that employees with different age and education have different opinion towards transformational leadership in food and beverage business in

Pathumthani Province. In addition, the result showed that employees with age lower than 20 years old agreed more on opinion towards transformational leadership than employees with age between 21 – 30 years old, between 31 – 40 years old and between 41 – 50 years old. Also, the study showed that employees with lower than bachelor's degree agreed more on opinion towards transformational leadership than employees with bachelor's degree, master's degree and higher than master's degree. This is because that the employees whose age is younger and less educational level requested more transformational leadership in order that they can be taught, be motivated, be inspired and be led to achieve the organizational goal. The result also matched with the study done by Rehan, Khan, & Khan (2016) who found that the age of people have different opinion towards transformational leadership. Also, the study is correspondent with the study done by Alenazi, Muenjohn, & McMurray (2017) who found that education of employees had relationship with leadership behavior including idealized influence attributed, idealized influence behavior, inspirational motivation, intellectual stimulation and contingent reward. The study was also supported by Chen, Chen and Chen (2010) who found that education can be a moderation of transformational leadership. However, the employees with different gender, marital status, position, monthly income and working duration do not have different opinion towards transformational leadership in food and beverage business in Pathumthani Province. This finding can be confirmed that; no matter whose employees' demographical characteristics are different, the employees in the organization are needed to be led in order to reach the same organization goal and mission. The study is corresponding to the study done by Mohammed, Othman, & D'Silva (2012) who studied the social demographic factors that influence transformational leadership styles and the result revealed that gender and marital status can influence transformational leadership styles. The study also matched with Rehan, Khan, & Khan (2016) who found that gender, qualification group and designation do not influence on transformational leadership.

From the study, it was found that employees with different demographical characteristics have different opinion towards green supply chain management in food and beverage business in Pathumthani Province. The result showed that employees with age lower than 20 years old also agreed more on opinion towards green supply chain management than employees with age between 21 – 30 years old, between 31 – 40 years old and between 41 – 50 years old. Additionally, the study showed that employees with lower than bachelor's degree agreed more

on opinion towards green supply chain management than employees with bachelor's degree, master's degree and higher than master's degree. This is because that the employees who have younger age and less educational level have more concerned about the management of green supply chain than others since there are difficulties in managing and greening the supply chain. The study matched with the research done by Pham & Pham (2017) who found that knowledge & experience can affect green supply chain management. In the meantime, employees with different gender, marital status, position, monthly income and working duration do not have different opinion towards green supply chain management in food and beverage business in Pathumthani Province due to the fact that employees with different characteristics are required to complete the job according to the organizational goal and mission.

From the study, it was found that transformational leadership in terms of inspiration motivation, idealized influence, individualized consideration and intellectual stimulation, has a positive effect on green supply chain management in food and beverage business in Pathumthani Province. This is because that green supply chain management requires the leader who can connect employees and lead them to change their beliefs and attitudes in order to achieve the organizational goal (Burn, 1978 and Bass 1985). The fellow employees can be led by leader's enthusiasm, confidence and achievable possibilities, respect and motivation, creative solutions to problems, and close consideration to their employees' developmental needs (Yammarino & Bass, 1990; Yammarino, Spangler & Bass, 1993; Bass & Avolio, 1995; House, 1977; Panopoulos, 1999). The study also matched with Li, & Hung (2009) who found that the transformational leadership has played an important role in workplace relationships and job performance. Also, Rehan, Khan, & Khan (2016) advocated that the transformational leadership can have an influence on quality management practices.

# 8. Recommendations

**Recommendations for practices**

1. Since the study found that the employees had opinion towards the transformational leadership in the "slightly" level and there are many more to improve; therefore, the organization should create some activities to motivate, train and cultivate them such as working in the team, rotating the jobs, work orientation, employee meeting and others.

2. Since the study found that the employees had opinion towards the green supply chain

management in the "slightly" level, the organization then should promote more green understanding and attempt to implement the green supply chain management in the organization.

3. Since the study found that the employees with age and education have more opinion towards the transformational leadership, the organization should then use the transformational leadership such as inspiration motivation, idealized influence, individualized consideration and intellectual stimulation to motivate them.

4. Since the study found that the employees with different age and education have more opinion towards the green supply chain management in the organization, the organization should then put the right jobs and duties to the right people.

5. Since the study found that the transformational leadership affected the green supply chain management, the organization should prioritize transformational leadership including inspiration motivation, idealized influence, individualized consideration and intellectual stimulation accordingly.

**Recommendations for future researches**

1. Since this study focusing on quantitative research, the next research should use the qualitative research by using in-depth interview in order to obtain the insights.

2. This study emphasized on the single area. The next study can extend the study to other area in order to see the different point of view.

3. According to the study found unfavorable level towards the transformational leadership in the organization, the organization should then conduct some activities; for example, leadership training program, teamwork or challenging assignment in order to train and create the transformational leadership for the employees.

4. Due to the fact that this study found the difficulty in implementing green supply chain management, the future study should concern about the problems, obstacles and challenges, especially in the food and beverage industry in order to find the proper solution for the industry.

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# （Short Communication）

# English and Chinese Communication in Yaowarat Community-Based Tourism Management

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## Abstract

This research aimed to examine the English and Chinese communication abilities of the leaders, and members in the communities who were related in tourism, opportunity and problems in English and Chinese communication. 30 leaders and members in Wat Traimit and Talad Noi community were selected by convenience sampling method. The instruments for collecting data were validated five-rating scale questionnaire and interview. The data was analyzed in percentage, mean and standard deviation. The research revealed that 1) Abilities of English and Chinese communication in listening, speaking, reading and writing were at moderate and low respectively. 2) Opportunities and problems in English and Chinese communication for proceeding in tourism activities were at low level ( $\bar{x}$ = 2.45) and ( $\bar{x}$ = 2.52).

**Keywords:** Communication, Tourism, Community, English, Chinese.

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# 1. Introduction

Community tourism in Thailand has many tourists from both domestic and international markets. Therefore, communication with foreign languages is necessary and unavoidable. Communication management with foreigners is, therefore, something that community tourism must realize and find ways to reduce the gap of such communication that may occur. So, language is an important medium to make effective management and development especially in both English and Chinese, which are the languages that are used to communicate with foreign tourists today. That is why the development of communication in English and Chinese is one of the issues that the community should focus on development as well. In addition, "Yaowarat" or "Chinatown" is the first modern business center in Thailand that has been driven by Chinese citizens since the reign of King Rama V, but at present, Chinatown that used to be an old commercial center and has been a Thai society for a long time is facing a variety of changes such as traditional community and social relations systems. Moreover, this place is a major tourist attraction in Bangkok, Thailand as well. The purpose of this research therefore is to study English and Chinese communication in Yaowarat Community-Based Tourism Management especially study the leaders and community members who were related in tourism, opportunity and problems in English and Chinese communication in order to obtain the basic information needed to promote and develop the quality of people to be able to communicate in English and Chinese in accordance with the objectives or to minimize communicative errors.

# 2. Material and Methods (or Experimental)

The population in this study is community leaders and community members who are involved in two communities' tourism in Yaowarat. 30 leaders and members in Wat Traimit and Talad Noi community were selected by convenience sampling method. The instruments for collecting data were validated five-rating scale questionnaire and interview. The data were analyzed by using SPSS statistical analysis program such as frequency distribution, percentage, mean, average and standard deviation.

# 3. Results and Discussions

The results of the study of English and Chinese communication abilities in the travel management of Yaowarat community can be divided into 5 parts as follows:

### 3.1 General information

Most of them are female, 63.33%, and male, 36.67%. They are single status, 53.33%,

and married status, 46.67%. Most of them are 26-34 years old, 33.33%, followed by 35-44 years, 23.33%, aged 46-54 years, 16.67% , and under 25 years, 13.33%. For about their occupation: there are 11 employees, 36.37%, 10 traders, 33.33%, 5 contractors, 16.67%, respectively. They graduated the Bachelor's degree 17 people or 56.67%, followed by 8 people or 26.67% of upper secondary school or vocational certificate. There are 12 people or 40.00% who have a role in the tourism group, sale products and services. Moreover, for the duration of attendance in community tourism found that most of the participants had 3 years or more, 11 people or 36.67%, followed by less than 1 year, 10 people or 33.33%, 1-3 years, 5 people or 16.67%, and never attended 4 people or 13.33%, respectively. Most of them or 18 people or 60% had never attended a tourist training course, while 12 people or 40.00% had attended it. Although 9 people or 30 % and 7 people or 23.33 % had attended English and Chinese language for tourism training courses, respectively, 21 people or 70.00% and 23 people or 76.67% had never attended the courses. Most of them or 25 people or 83.33% can communicate with English language in the tourism-related community, while there are 5 people or 16.67% cannot speak English.

**3.2 Abilities of English communication in listening, speaking, reading and writing skills**

English communication ability from this research found that: English communication ability regarding 1) the listening skill, it was found that the listening ability to communicate in English was at a moderate level or with an average of 3.25. When this research specific in each question found that the item of greeting was at high level or $\bar{x}$ = 3.70. There were 8 items that were at moderate level. They are the inquiries about the location, products or services, time, distance, foreign tourists information, travel information, asking for other help, and information about various activities of the community which $\bar{x}$ = 3.40, 3.37, 3.27, 3.27, 3.23, 3.17, 3.03 and 2.77 respectively. 2) the speaking skill, it was found that the English speaking ability was at a moderate level ($\bar{x}$ = 3.27). When considering each item, it was found that it was at a good level. There were 3 items: greeting, apologizing and thank you, and farewell were at a moderate level ($\bar{x}$ = 3.83, 3.67 and 3.53) respectively. There were 11 items which were the information of product, time, travel activities, service, your attractions, distance, tourists asking for help, negotiation, directions and / or travel, current events, and culture and traditions ($\bar{x}$ = 3.40, 3.37, 3.33, 3.33, 3.23, 3.23, 3.20, 3.03, 3.03, 2.87 and 2.73) respectively.

3) the reading skill, it was found that the English reading ability was at a moderate level ($\bar{x}$ = 2.87). When considering each item, it was found that most of them which were 10 items were at the moderate level. They were a letter or email, text about tourism information, tourist

attractions, travel information and / or directions, details about products or services, orders, travel information on websites, any agreements and contracts, cultural and traditional information, and activities of the community ($\bar{x}$ = 2.87, 3.27, 3.13, 3.07, 3.07, 2.93, 2.87, 2.83, 2.67, 2.63 and 2.57), respectively. Moreover, there was only one item which was about tourism article or newspaper was at a low level ($\bar{x}$ = 2.87). 4) the writing skill, the ability to communicate in English writing skill was at a moderate level ($\bar{x}$ = 2.73). When considering each item, there were 8 items that were at a moderate level. They were travel information and/or directions, details of products or services, mail or email, signs or information about tourism, receipt, memo, cultural and traditional information, and activities of community ($\bar{x}$ = 3.00, 2.90, 2.87, 2.77, 2.73, 2.73, 2.60 and 2.57), respectively. The last one was about describing place which was at a low level ($\bar{x}$ = 2.40).

### 3.3 Opportunities and problems in English communication for community tourism activities

Opportunities and problems in English communication for community tourism activities was at a low level ($\bar{x}$ = 2.45). When considering each item, there were 10 items which were at a moderate level. They were apologizing and thank you, product information, farewell, greeting, time, distance, cultural and traditional information, tourist activities, writing a sign or information about tourism, and writing articles about tourism ($\bar{x}$ = 2.93, 2.90, 2.90, 2.87, 2.83, 2.73, 2.67, 2.57, 2.53 and 2.53). In addition, there were 16 items which were at the low level like reading travel articles or newspapers, writing letters and email, general conversation, reading information on travel websites, explaining or answering questions about the tourists need help, writing about tourist attractions, write a short memo, explaining about your attractions, reading English letters or emails, writing a receipt, reading product or service details, reading travel book, reading various contract or agreement, SMS, reading the orders, reading short stories, and other publications ($\bar{x}$ = 2.50, 2.47, 2.43, 2.43, 2.40, 2.40, 2.37, 2.30, 2.30, 2.30, 2.30, 2.23, 2.17, 2.13, 2.07 and 2.07) respectively.

### 3.4 Abilities of Chinese communication in listening, speaking, reading and writing skills

Chinese communication ability from this research found that: Chinese communication ability regarding 1) the listening skill, it was found that Chinese listening ability to was at at a low level ($\bar{x}$ = 3.25). When considering in each question found that there were 6 items such as greeting, distance information, information of foreign tourists, asking for other help, and travel information which $\bar{x}$ = 2.90, 2.70, 2.63, 2.63, 2.53 and 2.53 respectively. Moreover, there were 3 items which were at low level. They were asking the information of time, place and

community ($\bar{x}$ = 2.50, 2.43, 2.27). 2) the speaking skill, it was found that the Chinese speaking ability was at a moderate level ($\bar{x}$ = 2.57). When considering each item, it was found that it was at a moderate level. There were 7 items such as greeting, apologizing and thank you, negotiation, explaining and answering the topic that the tourists request for help, farewell, services, and product information ($\bar{x}$ = 2.93, 2.83, 2.77, 2.75, 2.70, 2.63, and 2.53) respectively. There were 7 items which were at a low level. They were describing the tourism activity services, explaining your attractions, time information, directions and/or travelling, distance information, explaining the cultures and traditions, and talking the present situations ($\bar{x}$ = 2.50, 2.47, 2.47, 2.43, 2.37, 2.33 and 2.27) respectively. 3) the reading skill, it was found that the Chinese reading ability was at a low level ($\bar{x}$ = 2.13). When considering each item, all of them were at the low level. They were travel information and / or directions, text about tourism information, details about products or services, various agreements and contracts, a letter or email, orders, tourist attractions, travel information on websites, cultural and traditional information, and activities of the community ($\bar{x}$ = .00 2.40, 2.27, 2.27, 2.17, 2.13, 2.10, 2.07, 2.07, 2.07, 2.00, 1.87) respectively. 4) the writing skill, the ability to communicate in Chinese writing skill was at a low level ($\bar{x}$ = 2.08). When considering each item, all of them were at the low level. They were article or newspaper about tourism, tourism information on website, various agreements and contracts, orders, short stories, mail or email, text for tourism, details of products or services, and information about tourist attractions ($\bar{x}$ = 2.37, 2.27, 2.17,2.10, 2.07, 1.97, 1.97, 1.93, and 1.90), respectively.

### 3.5 Opportunities and problems in Chinese communication for community tourism activities

Opportunities and problems in Chinsese communication for community tourism activities was at a low level ($\bar{x}$ = 2.52). When considering each item, there were 13 items which were at a moderate level. They were greeting, apologizing and thank you, time, reading information on travel websites, farewell, general conversation, distance information, tourist activities, explaining cultural and traditional information, product information, reading Chinese letters or emails, explaining about your attractions, and reading travel articles or newspapers ($\bar{x}$ = 2.93, 2.90, 2.83, 2.80, 2.77, 2.73, 2.70, 2.70, 2.70, 2.60, 2.60, 2.57 and 2.57) respectively. In addition, there were 14 items which were at the low level like explaining or answering questions about the tourists need help, reading various contract or agreement, writing articles about tourism, writing a sign or information about tourism, reading the orders, reading short stories, writing a receipt, writing letters and email, reading product or service details, write a short memo, SMS,

and other publications ($\bar{x}$ = 2.50, 2.50, 2.47, 2.43, 2.40, 2.40, 2.37, 2.37, 2.37, 2.30, 2.27, 2.20, 2.20 and 2.00) respectively.

# 4. Conclusions

Problems of English communication of leaders and members in Wat Traimit and Talad Noi communities, Yaowarat, Bangkok was at the moderate level ($\bar{x}$ = 2.65). When considering each aspect: 1) English listening skill was found that leaders and members in Wat Traimit and Talad Noi communities, Yaowarat, Bangkok about the problems when they communicated with English language was at a moderate level ($\bar{x}$ = 2.79). All the problems they had were they cannot understand the foreign accent, do not know the meaning of the words, the foreign tourists speak so fast, cannot understand what the travelers say ($\bar{x}$ = 3.03, 2.80, 2.73, 2.60). 2) English speaking skill problem of leaders and members in Wat Traimit and Talad Noi communities found that they were at a moderate level ($\bar{x}$ = 2.65). There were 4 items such as the vocabulary problem, sentence structure, pronunciation, tourists do not know what they say ($\bar{x}$ = 2.89, 2.83, 2.77, 2.67), and there was 1 item which was at low level like they shy to say ($\bar{x}$ = 2.10) respectively. 3) English reading skill problems were at a moderate level ($\bar{x}$ = 2.42). There was 1 item, i.e., do not know the meaning was at a low level ($\bar{x}$ = 2.60). There were 2 items like do not understand the compound and complex sentences, and cannot read English language ($\bar{x}$ = 2.43, 2.23) respectively. And 4) English writing problems were at a moderate level ($\bar{x}$ = 2.69). All questions were at the moderate level such as cannot use incorrect word, cannot convey the meaning, cannot write in English language, spell incorrectly of English words, and know the vocabulary but do not write the sentences ($\bar{x}$ = 2.87, 2.80, 2.60, 2.60, 2.57) respectively.

However, Problems of Chinese communication of leaders and members in Wat Traimit and Talad Noi communities, Yaowarat, Bangkok was at the moderate level ($\bar{x}$ = 3.26). When considering each aspect: 1) all Chinese listening skill problems were at a moderate level ($\bar{x}$ = 3.26). They were they do not know the meaning of the words, the foreign tourists speak so fast, cannot understand what the travelers say, and cannot understand the foreign accent, ($\bar{x}$ = 3.40, 3.27, 3.27, 3.10). 2) all Chinese speaking skill problems of leaders and members in Wat Traimit and Talad Noi communities found that they were at a moderate level ($\bar{x}$ = 3.12). They were the tourists do not know what they say, sentence structure, vocabulary problem, pronunciation ($\bar{x}$ = 3.37, 3.30, 3.18, 3.07 and 2.70) respectively. 3) Chinese reading skill problems were at a moderate level ($\bar{x}$ = 3.37). There were 2 items, i.e., do not know the meaning and cannot write Chinese language were at a high level ($\bar{x}$ = 3.63 and 3.63). Moreover, there were 2

items like do not understand the compound and complex sentences, and cannot read Chinese language ($\bar{x}$ = 3.20, 3.03) respectively. And 4) all Chinese writing problems were at a moderate level ($\bar{x}$ = 3.33). They were spell incorrectly of Chinese words, cannot use incorrect word, cannot convey the meaning, and know the vocabulary but do not write the sentences ($\bar{x}$ = 3.50, 3.43, 3.27, and 3.10) respectively.

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## （Short Communication）

# Using of FMEA to Evaluate the Durable-Time of Boiler Tube

Yung-Jen Chen[a*], Chiu-Wen Lin[a*], Chung-Ting Hsu[a]

## Abstract

In this study, a simple fire-tube vertical boiler is used as an example, using the Failure Mode and Effect Analysis (FMEA) to investigation the possible causes of tube rupture and the mechanism of tube wall thinned. Finally, the Durable-Time of the reinstalled cross-tube is evaluated, which is great than $10^5$ hr., and satisfy the design requirement.

**Keywords:** Simple Fire-Tube Vertical Boiler, FMEA, Durable-Time.

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# 1. Introduction

A simple fire-tube vertical boiler [1] shown as Fig.1. It's cross-tube used as the main heat exchange in the boiler, which is used as an example, discusses the possible causes of the tube rupture and the thinned mechanism of the tube wall. The boiler heat transfer tube material Specification Grade is JIS G3461 STB340[2] D=88.9mm and $t_0$=5mm for carbon steel, which $D/t_0$=17.78<20, so it belongs to thick-wall tube [3]. Use premium diesel fuel, sulfur content less than 1% and Ash content less than 0.02%.

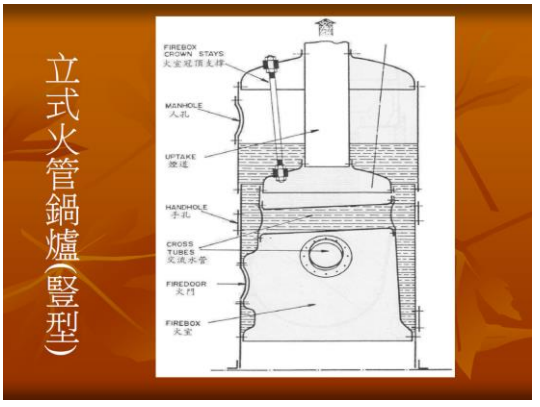


Fig 1. Simple fire-tube vertical boiler


Fig 2. Failure Mode and Effect Analysis

The boiler design working environment in the 400~450℃ below the temperature area, it not only high temperature creep fracture strength is low, but also produce graphite and make the tissue change, so it does not apply to high temperature areas. Considering the design of boiler high temperature fittings [4], the cross-tube of the boiler in this study, in addition to being a heat exchange thermal harvesting function, also has a structural function. Therefore, it is necessary to have both thin-wall and thick-wall tube characteristics.

Consideration of boiler pipe design [5], cross-tube using conditions are internal pressure, high temperature steady state distribution, unsteady distribution at heat transfer, in combustion gas, and Durable-Time need great than $10^5$ hr. And the material characteristics are long time creep strength and fatigue strength, also high environmental resistance included corrosion, ash-erosion and oxidation.

# 2. Failure Mode and Effect Analysis

In this study, a simple fire-tube vertical boiler is used as an example, using the Failure Mode and Effect Analysis **[6]** (FMEA) shown as Fig.2, to investigation the possible causes of the mechanism of tube wall thinned and tube wall rupture, there are list in Table 1.. And two

causes of tube rupture conditions in fire-side, which list in Table 2..

Table1. Mechanism and possible reason of thickness thinning of this cross tube.

| Mechanism | Cause |
|---|---|
| Water-side corrosion | Dissolved oxygen, free alkali presence. |
| Low temperature corrosion | High sulfur and sulfuric acid corrosion. |
| Fire-side corrosion | The fuel contains corrosive elements (S, …) |
| Tube scale | Too high Total Hardness. |

Data source: This study collates

Table2. Two fire- side conditions causes of tube rapture.

| Failure Mode | Causes of tube rapture |
|---|---|
| **t**ube rupture | Adhesion pot scale, local overheating.<br>Low temperature corrosion of anhydrous sulfuric acid. |

Data source: This study collates

From FMEA analysis and sample visual inspection the corrosion trace, this case should be local uniform corrosion [8]. Especially, the direct shock of the flame, it causes of tube rupture. The first part is fire-side low temperature corrosion, cause result in low temperature corrosion is sulfur in the fuel produces sulfuric acid corrosion. Secondary, is PH-value, it causes result in water-side corrosion. Third, is adhesion pot scale cause result in local overheating and produce pot scale.

## 3. Results and Discussions

The corrosion rate of metals in the atmosphere is affected by the diffusion rate of water and oxygen between water membranes, the content of chloride ions in the atmosphere, and contaminants such as SO2 and temperature [9]. The change of temperature can affect the condensation of water vapor on metal surface, the solubility of corrosive gases and salts in the aqueous film, the resistance of water film, and the reaction speed of yin and anode in the process of corrosion. Generally speaking, when the relative humidity is lower than the critical relative humidity of metal, the effect of temperature on atmospheric corrosion is very small, that is, no matter how high the temperature, due to the dry environment, metal corrosion is slight, but when the relative humidity reaches the critical relative humidity of metal, the reaction rate increases to twice times the original temperature per increase.

In this fire-side, the use of premium diesel, sulfur content and ash content are below the standard value, so the fire-side corrosion caused by the fuel is very slight. During boiler

deactivation was replaced by environmental corrosion. When boiler water PH-value should be 10.5-11.8, it is beneficial to the formation of oxidation film, which can control water-side corrosion [8]. But for the purpose in the production of steam cooking soybeans, for edible purposes, and generally do for the conversion of energy uses are different, PH-value should not be too high. Finally, water-side corrosion by adhesion pot scale cause result in local overheating and produce pot scale. In which caused by poor water quality.

This case is three days a cycle of use, boiler water purpose in the heating of steam cooking soybeans. And need to have the right amount of minerals to maintain the taste and characteristics of the finished products. Although it is easy to produce pot scale, but the two sides of the cross-tube is not equal to high design, help to reduce the risk of pot scale residue, from the replacement of the tube observation, really do not need to consider.

### 3.1 Environmental corrosion

Sulfur in the fuel produces sulfuric acid corrosion, the deterioration of steel caused by corrosion is one of the most easily occurring losses of cross-tube, it occurs in both normal use and in deactivation. In this case, use of premium diesel, sulfur content and ash content are below the standard value, so the fuel caused by the fire-side corrosion is very slight. In this study, it replaced by environmental corrosion ($SO_2$ of corrosive substances in the air) in Tianjong Industrial Parks Service Center Area Luo, Chen & Ko research [7], with average value of $R_f$=64.3μm/yr or 0.0643mm/yr.

Corrosion mechanism [9]:

$$Fe + H_2O \rightarrow Fe(OH^-)ads + H^+ \quad (1.1)$$

$$Fe(OH^-)ads \rightarrow Fe(OH)ads + e^- \quad (1.2)$$

$$Fe(OH)ads + SO_4^{2-} \rightarrow FeSO_4 + OH + e^- \quad (1.3)$$

Again,

$$FeSO_4 + H_2O \rightarrow FeOOH + SO_4^{2-} + 3H^+ + e^- \quad (1.4)$$

Thus, accelerates the corrosion reaction.

### 3.2 PH value

This case is three days a cycle of use, boiler water PH-value of 7.56~7.76. When the pH-value is between 4~10, the carbon steel maintains a certain corrosion rate as shown in the Fig 3.. The corrosion rate is $R_w$=0.01ipy or 0.254mm/yr.

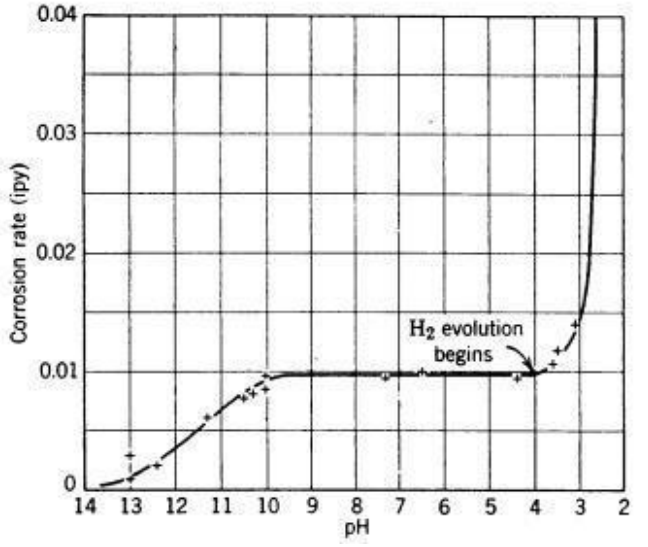


Fig 3. Corrosion rate vs. PH-value

# 4. Conclusions

### 4.1 Check Rupture Tube Life Time

The simple fire-tube vertical boiler per life period was three days, working eight hours at a time (22 hours cooling, empty water 42 hours), and durable life is 34.5 years. The fire-side corrosion rate is Rf=0.0643mm/yr, and water-side corrosion rate is Rw=0.01ipy or 0.254mm/yr. So, the fire-side thickness decrease is 1.294mm. And the water-side corrosion thickness thinned is 3.651mm. The corrosion allowance is α=1mm, residual thickness t=0.055mm＜1mm. Therefore, the tube thickness is insufficient. In the beginning the cross tube it belongs to thick-wall pipe. But, At D/t＞200, the membranes stress formula [11] can be simplified to σmax=σt=PD/2t. When D/t=86.312/0.055=1569＞200, the working pressure P=1~6kg/cm2 (Pmax=10kg/cm2), σmax= 78.472~471.852Mpa. The maximum stress σmax might great than 343Mpa. So, tube rupture is reasonable.

### 4.2 Evaluate the Reinstalled Tube Durable-Time

Similarly, the fire-side corrosion rate and the water-side corrosion rate same as above. The average corrosion rate is 0.1433mm/yr, and the corrosion allowance is 1mm. Yield the Durable-Time is 101,884hrs, it great than $10^5$ hr. Satisfy the design requirements.

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| 第一位評審意見 | 接受刊登 | 刊登 | 修正刊登 | 修正後再審 | ＊第三位評審 |
| | 修正後刊登 | 修正刊登 | 修正刊登 | 修正後再審 | 第三位 |
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