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About Us

RJCM is an international journal for academics and scholars at the higher education level to communicate and share their viewpoints and academic work with fellow professionals in the areas of creative entrepreneurship and management as practiced in their fields of specializations in social sciences.

RJCM publishes three numbers per volume annually and welcomes contributors to submit their manuscript in January, May, and September of each year. We accept both academic and research papers in social sciences from contributors. The papers are double-blind peer-reviewed in each volume and published online-plus-print thrice a year.

The length of the unformatted manuscript in WORD can be 15-25 pages in length including references. The contents of the manuscript should include (1) a title with the author's name, affiliate, email address and telephone contact, (2) an abstract of 150 words with 3-5 keywords, (3) an introduction, (4) a rationale and background of the study, (5) research objectives, (6) research methodology, (7) data collection procedure, (8) data analysis, (9) results and discussion, (10) research limitation (if any), (11) conclusion, (12) the author's biography of about 50-80 words, (13) acknowledgement(s) (if any), (14) references, and (15) an appendix or appendices (if any).

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Note from Editors of *RJCM* Volume 3 Number 1

Dear *RJCM* Readers,

You are now with our first issue in Year 3 of *RICE Journal of Creative Entrepreneurship and Management* (*RJCM*). This issue contains six articles in the areas of port logistics, digital technology, current management issues in higher education, and a trend in small performing arts organizations.

In this issue, we have one paper in the area of port logistics: *"Synergetic Development of Port Logistics and Regional Economy in Jiangxi Province"* (Article 1). We have two papers in digital technology and its applications: *"Medical Image Data Conversion to Design Anatomical 3D Models for Creative Medical Applications"* (Article 4) and *"The Use of Algorithm System Model in Teaching English to Thai Students*" (Article 5). Two more papers deal with current management issues in higher education: *"Faculty Members' Perception of the Thai University Administration Model in the Digital Age"* (Article 2), and *"Medical Image Data Conversion to Design Anatomical 3D Models for Creative Medical Applications"* (Article 3). The last paper reports a current trend in small performing arts organizations in Hong Kong: *"Beyond Size and Scale: Reflections on Small Performing Arts Organizations"* (Article 6). These articles report interesting findings and innovations in the areas under study. This issue also carries a brief professional viewpoint on a future vision of digital marketing for metaverse.

Our paper contributors in this first issue of 2022 are researchers from universities in China and Thailand: *Jiujiang University, The Chinese University of Hong Kong, King Mongkut's Institute of Technology Ladkrabang (KMITL), Rajapruk University, Rajamangala University of Technology Rattanakosin (RMUTR), and Bansomdet Chaopraya Rajabhat University (BSRU).*

The editors-in-chief hope that the research findings and innovations reported in these papers will be interesting to both researchers and practitioners in similar fields of study. The *RJCM* editorial team and the authors would appreciate our readers' comments about these articles, if possible. We always welcome contributions from those who may wish to be part of our *RJCM* network.

Nuttapong Jotikasthira, Ph.D., Editor-in-Chief 1
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Address from RICE Director

Nuttapong Jotikasthira, Ph.D.
Rattanakosin International College of Creative Entrepreneurship (RICE)
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Dear *RJCM* Readers,

The Covid-19 pandemic has been a cornerstone of a mankind history where things have never been this obscure, uncertain, and insecure, yet revealing. People do not know what is true, what to believe, and how they would have to adapt their worldviews and cope with things in their lives. Pseudoscience, conspiracy theories, fake news, are floated around in our information reception spans. For some, the Covid-19 phenomenon may need to be observed and explained by "reading-between-the-lines" as the social structures have become somewhat opaque and power holders have kind of restraining themselves from revealing the truth.

As such, the pandemic necessitates social theories to be retested empirically whether they still can explain, not to mention to predict, the social world. Undoubtedly, it has affected people from all walks of life, certainly including researchers and academics who have still continued with their work regardless of the limited channels of communication. The articles contributed to RICE Journal and Management and Entrepreneurship in this hard time would help fill the voids between academics and communities concerned.

I feel much obliged to all the authors for contributing the betterment of their work to academic communities. Your research in different fields of management and creative entrepreneurship certainly help reexamine the world temporarily blurred with uncertainties at the time of the pandemic.

Always with my best wishes for readers and paper contributors of *RJCM*.

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Synergetic Development of Port Logistics and Regional Economy in Jiangxi Province

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Abstract

Based on the entropy weight method and a synergy model of the composite system, the researcher investigated the synergetic development of port logistics and regional economy in Jiangxi Province, China. The results show that the evolution trend of order degree of port logistics and regional economy is rather consistent in falling first and then rising. From 2005 to 2010, the order degree of regional economy in Jiangxi Province was almost all higher than that of port logistics. Then both order degrees began to rebound after 2010, and the development degree of port logistics was higher than that of regional economy from 2012 to 2017. In the adjacent base period, the weak synergy degree of the composite system occurred in three years during 2006-2017, and was in a non-synergy state in the rest of the years, indicating that the connection and impact between port logistics and regional economy were relatively low and the synergy status greatly fluctuated. In the fixed base period, the synergy degree of the composite system of port logistics and regional economy carried a non-synergy status, and lacked a good synergetic development mechanism. On the basis of these findings, the author has some suggestions to strengthen infrastructure construction, promote the coordinated development of port groups, and accelerate upgrading of the industrial structure.

Keywords: *Entropy weight method, synergy model of composite system, port logistics, regional economy, order degree, development degree*

1. Introduction

1.1 Synergy of Port Logistics and Regional Economy

Synergy between port logistics and regional economy refers to the degree of organic combination, mutual promotion and synergetic development of the two. Port logistics, as a tertiary industry, has an impact on various aspects of regional economic development, such as promoting upgrading of the industrial structure, increasing talent cohesion, attracting capital, and accelerating infrastructure construction. On the other hand, regional economic development can also increase the demand for port logistics. The two complement and rely on each other. So far, the research on port logistics and regional economy has become a hot issue, and the application scope of synergetic has expanded from the original field of physics to those of economics and sociology. The main research of international scholars focuses on various issues. DRP authority of Philadelphia (1953) was the first to study the influence of ports on regional economic development. Slack (1990, 1996) studied the relationship between the port and the port hinterland under the change of transportation

mode, and discussed the coordinated development between the two. Pollock (1981) and Seabrooke et al. (2003) demonstrated the interactive relationship between port logistics and hinterland economy based on theoretical analysis and empirical research. Kisperska-Moron (1994) proposed that port logistics is an effective support for the rapid development of regional economy, an important factor affecting regional economic development, and it is also a content that should be fully considered when formulating long-term plans and planning strategies. Hillier (1999) used relevant fitting equations to evaluate the degree of coordinated development between the port system and the city system on the basis of the ideal city model, so as to further analyze the relationship between the port and the city. Omiunu (2002) and Fernández et al. (2004) studied the relationship between the Nile and Seville regions and their ports. Haken (2004) believes that the synergy of the overall system can reflect the coordination of internal subsystems.

The research of Chinese scholars mainly includes the following. Ming et al. (2011) used the entropy weight method to determine the weight of the index system and established the general synergic model of Dalian port and urban economy. The result shows that the synergic degree between the two is relatively high. Guan (2020) took six cities in the coastal economic belt of Liaoning Province as the research objects, and made a quantitative analysis by using synergy degree model of the composite system. She believed that the synergy degree of the economic composite system is low on the whole and the level of economic synergy among all cities is poor, and put forward relevant suggestions. Jie (2019) built a collaborative development model of water environment management system from the aspect of the four elements, analyzed the coordination state of the composite system from two aspects of the adjacent base period and fixed base period, and thought that the system coordination state is unstable under adjacent base level, so that synergy degree needs further ascension, and under the same base period, the system coordination degree is rising year by year, but the coordination level is low and slowly grows, and thus shows a future outlook. Chen et al. (2019) used entropy weight method to determine the weight of the index system, established the coordination degree model of the composite system of Jingzhou port logistics capacity and industrial structure upgrading, measured the order degree of each subsystem, and found that the order degree shows a downward trend. Chang (2019) believed that the port scale should be included in the index system, which can be measured by the length of the wharf, the number of berths and the number of 10,000-ton berths. Therefore, the synergetic model of port logistics and hinterland economy in Beijing-Tianjin-Hebei region was established, and the system has a high degree of coupling. Feng et al. (2019) studied the synergies between Ningbo port logistics and a port economic circle, and the results show that there are regional differences in the synergies, which could be divided into three echelons. Jing et al. (2020) used the entropy weight method to determine the weight of the index system and evaluated the carrying capacity through TOPSIS method. The research on port logistics and regional economy mostly focuses on the relevance and collaboration, as well as the division of hinterland economic regions. The main research methods include the regression method, grey correlation, a coordination model, the general synergic model, a system dynamics model and the VAR model, to name but the major ones, but these quantitative methods also have some limitations, for example, they are singular and cannot reflect the existing problem comprehensively, the indexes are

few, and the judgment on the weight of the index system is rather simple. Most researchers concentrated on the economically developed areas of China, such as Jiangsu, Zhejiang, and Beijing-Tianjin-Hebei. There is a lack of relevant research on economically backward provinces, particularly Jiangxi Province.

1.2 Jiangxi Province

As one of the nine provinces and two cities along the Yangtze River Economic Belt, Jiangxi Province is an inland open economic pilot zone established by China. It is located in the central region of China, with 152 km of golden coastline along the river and convenient transportation, so it has a unique location advantage. Under the strategic background of the country's key implementation of the Yangtze River Economic Belt, Jiangxi Province has issued a series of policies and measures, actively participated in the Yangtze River Economic Belt development, and established a regional network of the channel system. The Province has built Jiujiang port and Nanchang port as the cores of the regional logistics center to accelerate the inland waterway transport modernization with intensification of ports, large-scale and standardized ships, and advanced information platform. In order to realize its strategic goal, the Province has carried out research into synergetic development of port logistics and regional economy to promote its further prosperity.

1.3 Research Method

Based on the selection principles of the index system and the availability of data, the researcher established a multi-index system that can fully reflect the characteristics of the two subsystems of port logistics and regional economy. The entropy method was used to determine the weight of the index system, which effectively eliminated human interference factors, made the research results objective and fair, and then created a synergy model of the composite system of port logistics and regional economy in Jiangxi Province. Two synergy measurement methods of adjacent base period and fixed base period were adopted instead of a single method of synergy measurement, the synergetic development degree and evolution trend of port logistics and regional economy in Jiangxi Province were analyzed to obtain suggestions for Jiangxi Province in achieving the synergetic development of the two was put forward.

2. Synergy Model of Composite System

2.1 Order Degree Model of Subsystem

Suppose there are several subsystems in the composite system S, so S can be expressed as $S = \{S_1, S_2, S_3,.., S_i\}$, where $i \in [1, m]$, $m \geq 2$, is a positive integer, $i = 1, 2, 3,..., m$. The order parameter of subsystem S_i is $S_i = \{x_{i1}, x_{i2}, x_{i3},.., x_{ij}\}$, where $j \in (1, n)$, $n \geq 2$, is a positive integer, $j = 1, 2, 3,..., n$. The order degree X_{ij} of the order parameter component x_{ij} of subsystem S_i is calculated as follows:

$$X_{ij} = \begin{cases} \dfrac{x_{ij} - \beta_{ij}}{\alpha_{ij} - \beta_{ij}}, & x_{ij} \text{ is a positive index} \\ \dfrac{\alpha_{ij} - x_{ij}}{\alpha_{ij} - \beta_{ij}}, & x_{ij} \text{ is a negative index} \end{cases} \quad (1)$$

Where, $X_{ij} \in [0, 1]$; α_{ij} and β_{ij} are respectively the upper and lower limits of subsystem's order parameter component x_{ij}, namely $\beta_{ij} \leq x_{ij} \leq \alpha_{ij}$. If x_{i1}, x_{i2}, x_{i3}..., and x_{ij} are positive

indexes, the greater the value is, the better is. It means that the greater the contribution of the order parameter component x_{ij} to the subsystem S_i is, the higher the degree of order will be. If x_{i1}, x_{i2}, x_{i3}... and x_{ij} are negative indexes, the larger the value is, the smaller the contribution to the subsystem S_i is, and the lower the order degree is. The sum of the order degree of each order parameter component of the subsystem is the order degree of the subsystem. In this paper, the linear weighted sum method is adopted to calculate the order degree X_i of the subsystem S_i:

$$X_i = \sum_{j=1}^{n} w_{ij} \cdot X_{ij}, \ 0 \le w_{ij} \le 1, \ \sum_{j=1}^{n} w_{ij} = 1 \quad (2)$$

Where, w_{ij} is expressed as the weight of the order parameter component x_{ij}.

2.2 Order Parameter Weights of Subsystem

The order parameter weights of subsystem are an important factor affecting the order degree of subsystem. The weight is determined by the entropy weight method, which is an objective weighting method. The basic idea of determining the objective weight is based on the dispersion degree of the index. The greater the entropy value is, the greater the dispersion degree of the index is, and the greater the weight in the system is.

2.2.1. Calculation of the Contribution Degree of Order Parametric Component

The contribution degree P_{ijy} of the order parameter component x_{ijy} in a certain year can be expressed as:

$$P_{ijy} = \frac{x_{ijy}}{\sum_{y=1}^{r} x_{ijy}} \quad (3)$$

Where, y represents different years, and $y \in [1, r]$, $r \ge 2$, is a positive integer, $y = 1, 2, 3,...$

2.2.2. Calculation of Entropy of Each Order Parameter Component

Entropy E_{ij} is the total contribution of all years to the order parametric component x_{ijy} , and the calculation formula is:

$$E_{ij} = -k \cdot \sum_{y=1}^{r} \ln(P_{ijy}) \cdot P_{ijy} \quad (4)$$

Where, $k = 1 / \ln(r)$, k is constant.

2.2.3. Calculation of Entropy Weight

According to the entropy value of the order parameter component x_{ij}, the degree of dispersion is determined, namely $(1- E_{ij})$. The greater the degree of dispersion is, the greater the weight is. The weight calculation formula is as follows:

$$w_{ij} = \frac{(1 - E_{ij})}{\sum_{j=1}^{n} (1 - E_{ij})} \quad (5)$$

Where, w_{ij} is the weight of the order parameter component x_{ij} in the subsystem S_i.

2.3 Synergy Model of Composite System

There are two methods to calculate the synergy degree of the composite system. One is to calculate the synergetic state and evolution trend of the system based on the fixed base period. The other is based on adjacent base period to analyze whether the synergetic status between the subsystems is stable. Assuming that at the initial time t_1, the order degree of each subsystem is X_i^1, $i \in [1, m]$, and when the system develops to time t_2, the order degree of each subsystem is X_i^2, then the synergy degree of the composite system S is calculated as follows:

$$C = \eta \cdot \sqrt[m]{\prod_{i=1}^{m} \left| X_i^2 - X_i^1 \right|} \qquad (6)$$

Where $\eta = \begin{cases} 1, & X_i^2 - X_i^1 \geq 0 \\ -1, & \text{others} \end{cases}$, $C \in [-1,1]$, the greater the C value is, the better the synergetic status between the two subsystems in the composite system is, the system will tend to generate a new ordered structure. The smaller the C value is, the more disordered the system is. The criteria for judging the composite system state are shown in Table 1.

Table 1: The Criterion for Determining the Degree of Synergy

C value	$-1 \leq C \leq 0$	$0 \prec C \leq 0.3$	$0.3 \prec C \leq 0.7$	$0.7 \prec C \leq 1$
System state	non-synergy	weak synergy	general synergy	strong synergy

3. Establishment of Synergy Model of Jiangxi Province's Port Logistics and Regional Economic Composite System

3.1 Index Selection and Data Sources

3.1.1. Index Selection

The index selection should not only reflect the characteristics of the two subsystems, but also follow the selection principle of the index system. *The port logistics subsystem* can be considered from two aspects of port construction and port operation; its indexes mainly include port cargo throughput, container throughput, the total number of ports, wharves, berths, loading and unloading machineries, the total length of wharves and berths, the number of one-thousand tonnage level berths and ten-thousand tonnage level ports and port operating revenue. *The regional economic subsystem* can be considered from the aspects of economic scale, people's quality of life, social development and employment. The indexes mainly include GDP, per capita GDP, urban per capita disposable income, total retail sales of social consumer goods and the number of social employees. In addition to the selection principle of indexes, the availability of data should also be considered, and the indexes should be determined by the Delphi method, as shown in Table 2.

Table 2: The Index System of Jiangxi Port Logistics and Regional Economic Subsystem

Subsystem	Symbol	Order parameter	Index sign	Index point
Port logistics	S_1	Port cargo throughout ($\times 10^9$ t)	x_{11}	Forward
		Port container throughout ($\times 10^4$ TEU)	x_{12}	Forward
		Investment in transport infrastructure ($\times 10^9$ Yuan)	x_{13}	Forward
		Number of ports	x_{14}	Forward
		Number of production berths	x_{15}	Forward
		Wharf length (m)	x_{16}	Forward
		Number of loading and unloading chineries	x_{17}	Forward
Regional economy	S_2	GDP ($\times 10^9$ Yuan)	x_{21}	Forward
		Total import and export value ($\times 10^9$ USD)	x_{22}	Forward
		Fixed asset investment ($\times 10^9$ Yuan)	x_{23}	Forward
		Number of social employees ($\times 10^4$)	x_{24}	Forward
		Per capita GDP (Yuan)	x_{25}	Forward
		Urban per capita disposable income (Yuan)	x_{26}	Forward
		Total retail sales of social consumer goods ($\times 10^9$ Yuan)	x_{27}	Forward

3.1.2. Data Sources

In this paper, the relevant data of Jiangxi Province from 2005 to 2017 for empirical study was selected from Jiangxi Statistical Yearbook, Jiangxi Traffic Yearbook, Jiangxi Statistical Bulletin, Yangtze River Yearbook and China Port Yearbook.

3.2 Calculation and Evaluation of Synergy Degree of Composite System

3.2.1. Data Standardization

In order to eliminate the influence of different dimensions on the original data of order parametric component, SPSS (Statistic Package for Social Science) was used to conduct 0-1 standardized processing on the original data, that is, after dimensionless, the mean value and standard deviation of each order parametric component data are respectively 0 and 1.

3.2.2. Weight Calculation

Entropy value and dispersion degree of order parameters of each subsystem were calculated according to the entropy weight method, and their weights were computed accordingly, as shown in Table 3.

Table 3: The Weight of Order Parameters of Each Subsystem

Subsystem	Symbol	Order parameter	Weight of index symbol	Entropy	Dispersion	Weight
Port logistics	S_1	Port cargo throughout ($\times 10^9$ t)	w_{11}	0.9783	0.0217	0.1788
		Port container throughout ($\times 10^4$ TEU)	w_{12}	0.947	0.0530	0.4363
		Investment in transport infrastructure ($\times 10^9$ Yuan)	w_{13}	0.9574	0.0426	0.3504
		Number of ports	w_{14}	0.9999	0.0001	0.0012
		Number of production berths	w_{15}	0.9997	0.0003	0.0023
		Wharf length (m)	w_{16}	0.9986	0.0014	0.0112
		Number of loading and unloading machineries	w_{17}	0.9976	0.0024	0.0199
Regional economy	S_2	GDP ($\times 10^9$ Yuan)	w_{21}	0.9552	0.0448	0.1388
		Total import and export value ($\times 10^9$ USD)	w_{22}	0.9299	0.0701	0.2174
		Fixed asset investment ($\times 10^9$ Yuan)	w_{23}	0.9261	0.0739	0.2293
		Number of social employees ($\times 10^4$)	w_{24}	0.9995	0.0005	0.0014
		Per capita GDP (Yuan)	w_{25}	0.953	0.0470	0.1456
		Urban per capita disposable income (Yuan)	w_{26}	0.9687	0.0313	0.0970
		Total retail sales of social consumer goods (×109 Yuan)	w_{27}	0.945	0.0550	0.1705

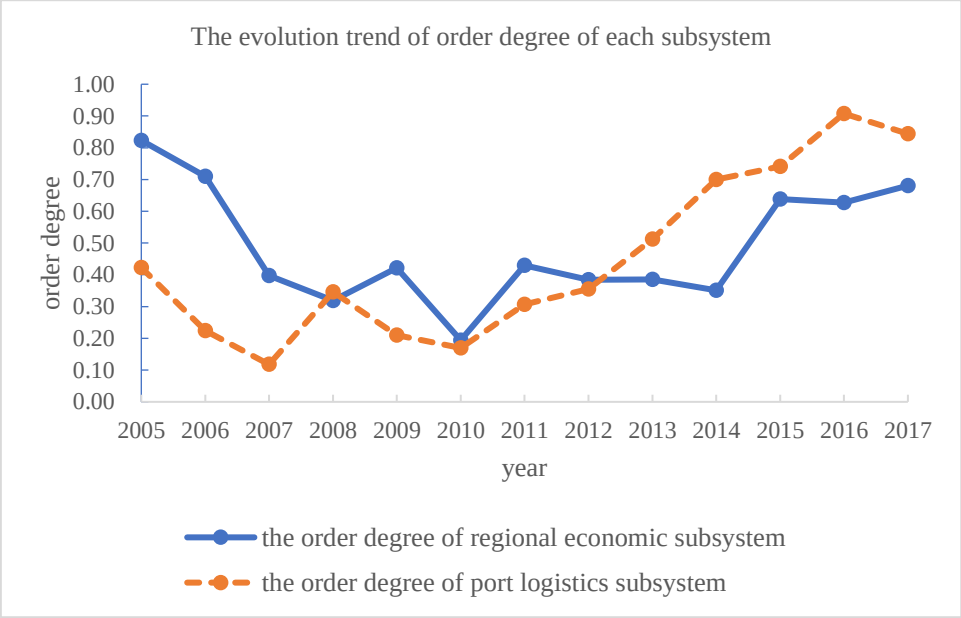
3.2.3. The Order Degree Calculation of Each Subsystem

According to Equation (1), the order degree of the order parameter component of each subsystem was calculated. On this basis, the order degree of each subsystem in Jiangxi Province from 2005 to 2017 was counted according to Equation (2), and shown in Table 4 and Figure 1.

Table 4: The Order Degree of Each Subsystem in Jiangxi Province from 2005 to 2017

Year	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Port logistics	0.4224	0.2246	0.1178	0.3457	0.2102	0.1698	0.3067	0.3553	0.5125	0.7003	0.7414	0.9076	0.8444
Regional economy	0.8231	0.7101	0.3971	0.3188	0.4218	0.1941	0.4302	0.3847	0.3857	0.3508	0.6381	0.6269	0.6803

Figure 1: The Evolution Trend of Order Degree of Each Subsystem from 2005 to 2017



As seen in Table 4 and Figure 1, the evolution trend of the order degree of port logistics subsystem and regional economic subsystem in Jiangxi Province presented a high consistency. The order degree of two subsystems in 2005-2010 showed the declining trend, but the order degree of the regional economy subsystems was almost higher than that of the port logistics subsystems during this period. After 2010, the order degree began to rebound, and then the order degree of port logistics was higher than that of the regional economy in 2012-2017. Since 2010, Jiangxi Province has introduced a number of policies, actively responded to the country's strategy of developing the Yangtze River Economic Belt, and speeded up modernization construction of waterway transportation in Jiangxi Province. In 2010, Jiangxi Province issued "Several opinions on supporting the golden waterway construction of the Yangtze River and improving the level of waterway transport development," increased investment in infrastructure, and built three one-thousand tonnage level berths. In 2011, the three-level channel increased by 92 km and the four-level channel by 87 km. At the same time, the Province has promoted the development of "large-scale and standardization" transport vessels, and the average deadweight cargo tonnage of vessels has increased from 208 t in 2005 to 504 t in 2011. In 2012, Jiangxi Province issued " Opinions of the People's Government of Jiangxi Province on further promoting the opening and development of Jiujiang along Yangtze River," Jiujiang Port, that is as the only transportation hub port of Yangtze River in Jiangxi Province, highlighted its importance by putting forward to exploit shoreline and construct port as the key point, promoting large-scale opening, exploitation and development along the river, and building a strategic port structure of "one leader, three linkages." The construction of ports and wharves was dominated by large-scale, intensification and specialization, and began to make full use of the advantages of the Golden waterway, port shoreline, waterway transport resources and comprehensive traffic location of Yangtze River. The effect of these policies has been verified over time, and yielded the phased

results since 2012. The port logistics subsystem began to develop rapidly, and its orderly development degree was higher than that of the regional economic subsystem.

3.2.4 Synergy Degree Calculation of the Composite System

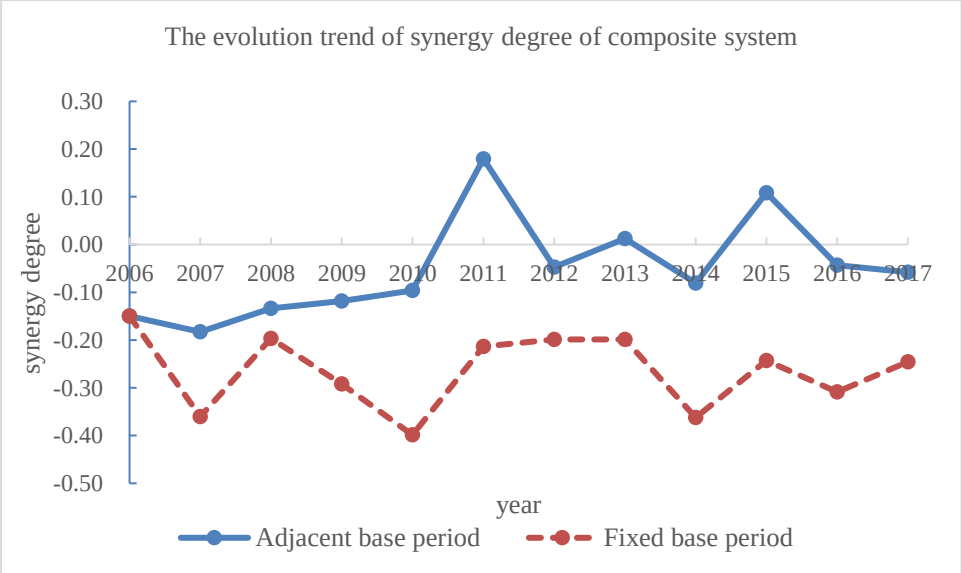
According to Equation (4), the synergy degree between port logistics and the regional economic subsystem in Jiangxi Province from 2005 to 2017, based on fixed base period and adjacent base period, was calculated respectively, as shown in Table 5 and Figure 2.

Table 5: The Coordination Degree between Port Logistics and Regional Economic System in Jiangxi Province from 2005 to 2017

Year		2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Adjacent base period	System synergy	-0.1495	-0.1828	-0.1336	-0.1181	-0.0959	0.1798	-0.0470	0.0124	-0.0809	0.1086	-0.0432	-0.0581
	System status*	non	non	non	non	non	weak	non	weak	non	weak	non	non
Fixed base period	System \synergy	-0.1495	-0.3603	-0.1968	-0.2918	-0.3986	-0.2133	-0.1984	-0.1984	-0.3623	-0.2429	-0.3085	-0.2455
	System status*	non	non	non	non	non	non	non	non	non	non	non	non

*: non (non-synergy), weak (weak synergy).

Figure 2: The Evolution Trend of Synergy Degree between Port Logistics and Regional Economic System in Jiangxi Province from 2005 to 2017



Different synergy degrees between port logistics and regional economy in different periods reflect different dynamics and complexity (Ming et al., 2011). Table 5 and Figure 2 indicate that those based on system synergy of adjacent base period had only three years in weak synergy of two subsystems during 2006 - 2017, while the synergy value of other years was less than 0 and in a non-synergy state. The maximum synergy value was 0.1798 in 2011 and the minimum value was -0.1495 in 2006. During this period, it experienced

more variation in a gradual rise, a surge, a sharp drop, or a steady and re-surge, which indicated that the synergy between port logistics and regional economy subsystem was unstable. From 2005 to 2010, the modernization level of waterway transport in Jiangxi Province was not enough, and waterway transport infrastructure conditions were poor, which failed to form an open, orderly, safe and efficient waterway transport market. At this period, the lower regional economic development level could not stimulate the logistics demand. The development of port logistics lagged behind, which was still manifested in the traditional cargo handling, storage and transfer functions. Port enterprises had too many operating subjects, small scale, low management level, weak competitiveness and feeble anti-risk ability.

Since 2010, Jiangxi Province issued the relevant policies to increase investment in inland waterway construction, and initiated Nanchang-Jiujiang integration development planning in 2014. The system synergy degree increased in 2010, 2013 and 2015, but the status was not stable and weak synergy appeared. It indicated under the impetus of policies: waterway transport developed rapidly, construction of supporting infrastructure accelerated, the loading and unloading capacity of port enhanced, and port logistics began to shift from traditional logistics to modern logistics mode. Regional economic development was faster too, but the order degree was lower than that of the port logistics; the logistics demand was increasing. After 2015, the synergy degree declined again. Although Jiangxi Province proposed to construct "two rivers and two ports" planning in 2015, the effect of policies and construction was lagging behind. In general, the relationship and influence between port logistics and regional economy in Jiangxi Province are still relatively low, and the synergy between the two subsystems is not stable and fluctuates greatly.

The analysis reveals that based on system synergy of fixed base period (with 2005 data in the fixed base period), port logistics and regional economy were in a non-cooperative state. With the implementation of policies, port logistics has transformed from the traditional to the modern logistics model. Since 2010, port logistics has developed rapidly, and met the needs of regional economic development in support of export-oriented economy in Jiangxi Province. It should be noted that current port logistics cannot rapidly drive the development of regional economy, and the synergetic development mechanism has not been well established due to its vulnerability to interference factors.

4. Conclusion and Suggestions

4.1 Conclusion

Based on the entropy weight method and the synergy model of the composite system, a synergy model of the composite system of Jiangxi Province port logistics and regional economy was established, the weight of the order parameter components of each subsystem was determined with the entropy weight method, and both order degrees of Jiangxi port logistics and the regional economic subsystems and the system synergy degree from 2005 to 2017 were given. The research results show that the order degree evolution trend of port logistics and the regional economic subsystems continuously declined in 2005-2010, but with the order degree of the regional economy subsystem almost higher than that of the

port logistics subsystem during this period. Then the trend began to rebound in 2010 and moved upward from 2012 to 2017. At this period, the orderly development degree of port logistics was higher than that of regional economy. In the case of adjacent base period, only system synergy in three years showed a weak synergy status from 2006 to 2017, while the remaining years in a non-synergy status. It indicated that the system synergy status was rather unstable and needed further improvement. Under the condition of fixed base period, the system synergy of all years was in a non-cooperative state, and the system did not form an effective synergetic development mechanism.

4.2 Suggestions

Based on the results of the study, the author would like to suggest three actions:

4.2.1. Strengthen Infrastructure Construction

According to the previous analysis of the entropy weight method, although the investment in transportation infrastructure accounts for an important proportion, it is difficult to meet the demand of rapid development. Jiangxi Province should increase investment in infrastructure construction persistently, further improve the channel level, speed up the construction process of "two rivers and two port," optimize the port function, strengthen the port capacity, promote the development of port transformation from traditional logistics to modern logistics, and realize the extension of integrated logistics services. To improve hardware configuration, the ports should also enhance their soft power, strive to achieve modernization, informatization, automation and intelligent development, and further promote regional economic development based on the development of port logistics. All these are to drive the optimization of the industrial structure and the establishment of a comprehensive transportation system for the aggregation of logistics enterprises.

4.2.2. Promote Coordinated Development of Port Groups

Besides Jiujiang Port on the main line of Yangtze River, there are also several ports on the tributaries of Yangtze River in Jiangxi Province. The ports should promote coordination among them, and take the advantage of the spanning area to build information platforms and open waterway transportation channels. On the one hand, the government can make a unified plan for the industries of each port to avoid vicious competition; on the other hand, it is conducive to accelerate the development and cooperation of regional economy and provide necessary logistics service support for regional economic development.

4.2.3. Promote Upgrading of the Industrial Structure

Since traditional industries account for 70% of the real economy of Jiangxi Province, it is necessary to accelerate the optimization and upgrading of the industrial structure, shift industries from low value-added to high value-added, and realize the transformation of industry from low to high additional value. The Province should consider implementing green manufacturing, innovative manufacturing, intelligent manufacturing, and fully integrating modern digital technologies in support of the industry development toward integration and intensification.

5. The Author

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Media Exposure Behavior and Satisfaction with Public Relations Media for Decision-making on Study Program at the Undergraduate Level: A Case of Thai High School Students

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Abstract

This research aimed to investigate (1) the demographic variables related to media exposure behavior, and satisfaction with exposed public relations media, and 2) relationships among study plans, duration of media exposure, and influential persons for decision-making. The subjects were 400 high school students in the academic and vocational streams in three provinces: Petchaburi, Prachuapkhirikhan, and Chumphon. The researchers used a survey questionnaire to collect data in June- September 2019. The obtained data were analyzed by frequency, percentage, mean, standard deviation (S.D), chi-square and one-way ANOVA. The results were: (1) the subjects were in favor of websites (32.80%) and social media (20.3%) as suggested by their friends (50.3%) to obtain information for decision-making on study programs at the undergraduate level; (2) the preferred duration for the exposed public relations media was 6-12 months, (2) friends are influential in decision-making, and (4) the types and channels of exposed media did not relate to their satisfaction with media exposure. The researchers expected that the obtained findings can help universities plan for their student recruitment strategies effectively.

Keywords: *Media exposure behavior, satisfaction, decision-making on study program, high school and vocational students*

1. Introduction and Rationale of the Study

Higher education has its goal on providing education for graduates in terms of academic quality, knowledge, and forefront ideas in accordance with the needs of society, the changing trends of the world in modern times, and the sense of morals and social responsibility. Education plays a very important role in providing career opportunities for the Thai youth. A shortage of youth with good potential will slow down development of the nation toward prosperity at the international level. The government has to pay attention to the issue of workforce development by means of quality education, particularly the national policy on educational support to expand educational opportunities for students in all subject areas as stated in National Education Act, B.E. 2542 (Ministry of Education Thailand, 1999).

Universities undoubtedly play a vital role in providing education to meet the needs and expectations of students and have admission strategies to attract them to study programs offered in their academic calendar. Universities compete for their market share as a dream university in terms of a high academic ranking for excellence in teaching and research, modern technologies, and a recognized image in the circle of top-standing higher education institutions. Their target communities include social leaders or influencers, parents and counseling teachers to guide students' decision-making on a chosen university. As generally practiced, each university has arranged for its internal departments to survey the needs of potential customers and regularly conducted research on the public's perception of the university's image in various study fields for updated marketing plans The current educational marketing trend is in line with the government's continuous development of information technology infrastructure in order to provide people with equal access to news and information. The use of smart phones, computers, and the Internet is to provide knowledge, skills and competencies in various fields for the development of the country in all aspects to catch up with today's world. Information technology has created an era of communication without borders and time limits. People can easily seek information for their study, work, and business (Information Technology and Vocational Education Center, 2018).

Since information is an important resource for human development at all levels, universities pay close attention to three kinds of resources: natural, human and information as essential foundations for the advancement of society and economy which are indispensable in making decisions at various levels of operations. According to a survey of the National Statistical Office Thailand in 2012, there were 21.2 million computer users or 33.7 percent, Internet users 16.6 million or 26.5%, and mobile phone users 44.1 million or 70.2 percent. The survey revealed that Thai people increased access to cyber media and communication technology. In the past, news dissemination and exposure focused on the mainstream media, such as television, radio and newspapers. But now with the development of communication technology, changes in new media occur rapidly and create more channels in sending, receiving, accessing and retrieving information for convenience and time-saving.

The field of Public Relations consists of the sender (Source), the message (Message), the media (Channel) and the receiver (Receiver) (Stavetin, 1996). The public relations process focuses on the audience as the sole target. Public relations can be effective when the recipient receives the media or news until the recipient reaches a desired decision. Their perceptions, attitudes, and behaviors, exposure to public relations media generally mean mass media exposure. Pattamathin (1973) gave the meaning of media exposure as a scope the public being exposed to various types of media. The media widely used in public relations today can be divided into four types: personal media, mass media, internet media and special media The media are vitally important to public relations and no one type of media is best for every purpose. Publicists therefore need to know how to use media to suit public relations purposes. Media contents and target groups must be carefully considered to ensure effective communication.

The researchers recognize the importance of higher education, media and channels in sending-receiving public relations information for receivers' decision-making on a chosen study program at the university of their choice. The researchers therefore would like to investigate high school students' media exposure behavior and their satisfaction with the exposed public relations media for decision-making on a study program at the undergraduate level.

2. Research Objectives

There were two research objectives:

(1) To identify the demographic variables related to media exposure behavior, and satisfaction with exposed public relations media, and

(2) To investigate relationships among study plans, duration of media exposure, and influential persons for decision-making.

3. Scope of Research

This research covered a group of 400 high school students in the academic and vocational streams in three provinces: Phetchaburi, Prachuap Khiri Khan and Chumphon during June-September 2019.

4. Research Methods

The subjects were 400 high school students in the academic and vocational streams in three provinces: Phetchaburi, Prachuap Khiri Khan and Chumphon. There were 200 students from each stream making 400 in total and participating in the study on a voluntary basis.

As for the research instrument, the researchers used a survey questionnaire to collect data from the subjects. The questionnaire was tested for content validity and reliability (internal consistency) before reaching the final version. The researchers used the constructed questionnaire to collect data in June-September 2019.

5. Data Analysis

The researchers used both descriptive and inferential statistics to analyze the obtained data as follows:

(1) Descriptive statistics to secure frequency, percentage, mean and standard deviation of personal and social response data on media exposure behavior and satisfaction with the exposed public relations media for decision-making on a study program at the undergraduate level.

(2) Inferential statistic to test the relationship between independent and dependent variables with the use of (1) chi-square, and (2) one-way analysis of variance (One-way ANOVA).

6. Research Results

6.1 Types of Public Relations Media

The results on public relations media used by the subjects to obtain information needed for their decision-making on a study program pointed to university websites at 32.8%, print media, such as posters, brochures at 22%, and social media, such as Line, Facebook, Instagram at 20.3%. Other public relations media types received less attention: school counselors (14.5%), alumni of the school (6%), the university's educational guidance activities as in an open house (4%) and the university's organized educational guidance activities (0.5%). (See Table 1.)

Table 1: Frequency and Percentage of Types of Public Relations Media

Types of Public Relations Media	Frequency	Percentage
University website	131	32.8
Social media, such as LINE, Facebook, Instagram	81	20.3
Print media, such as posters, brochures	88	22.0
School alumni	24	6.0
School guidance teacher	58	14.5
The university's educational guidance activities.	2	0.5
The university's educational guidance activities (Open House)	16	4.0
Total	400	100.00

6.2 Exposure Duration

The researchers found that the subjects were in favor of the media exposure duration for further study for 6-12 months before submitting their application (48.5%). This preference was followed by 3-6 months (32.8%). Less preferred durations were 1-3 months (9.8%) and more than 12 months (9%), as shown in Table 2.

Table 2: Frequency and Percentage of Preferred Exposure Duration

Exposure Duration	Frequency	Percentage
1 – 3 months	39	9.8
3 – 6 months	131	32.8
6 – 12 months	194	48.5
More than 1 year	36	9.0
Total	400	100.00

6.3 Persons Involved in Decision-Making

As seen in Table 3 on persons involved in the subjects' decision-making on using public relations media, it was found that friends were the most influential (50.3%), followed by guidance teachers (16.8%), the majority of people in society (16.0%), family members (12.8%), self (3.5%), and famous people and celebrities (0.8%).

Table 3: Frequency and Percentage of Persons Involved in Decision-Making on Accepting the Media

Persons Involved in Decision-Making on Accepting the Media	Frequency	Percentage
Friends	201	50.3
Family members	51	12.8
Famous people and celebrities	3	0.8
Majority of people in society	64	16.0
School guidance teacher	67	16.8
Self	14	3.5
Total	400	100.00

6.4 Test Results of Hypothesis Testing

6.4.1 Relationship between the Study Plan and the Length Media Exposure before Admission

Table 4 shows that the relationship between the study plan and the length of media exposure before admission is not statistically significant. The study plan does not impact the length of media exposure before admission

Table 4: Test Results on the Relationship between Study Plan and Length of Media Exposure before Admission.

Study Plan	**Length of Media Exposure before Admission**			
	1-3 months	3- 6 months	6-12 months	More than 1 year
Academic stream	18 (9.0)	68 (34.0)	100 (50.0)	14 (7.0)
Vocational stream	21 (10.5)	63 (31.5)	94 (47.0)	22 (11.0)
$x2$	2.385			
Sig.	.496			

6.4.2 Relationship between Gender and Persons Involved in Decision-Making on Accepting the Media

The results shown in Table 5 indicate that there is relationship between gender and persons involved in decision-making on accepting the media.

Table 5: Test Results on the Relationship between Gender and Persons Involved in Decision-Making on Accepting the Media

Gender	**Persons Involved in Decision-Making on Accepting the Media**					
	Friends	Family members	Famous people and celebrities singers, actors, etc.	Majority of people in society	Self	Other
Male	29 (22.0)	27 (20.5)	1 (0.8)	32 (24.2)	34 (25.8)	9 (6.8)
Female	172 (64.2)	24 (9.0)	2 (0.7)	32 (11.9)	33 (12.3)	5 (1.9)
$x2$	64.636					
Sig.	.00					

Table 5 reports the Sig. $(.00) < .05$, thus rejecting H0, accepting H1 at a significance level of $.05$, i.e., gender difference. The persons involved in decision-making on accepting public relations media are different.

6.4.3 Relationship between Study Plan and Persons Involved in Decision-Making on Accepting the Media

Table 6 shows that there is relationship between the study plan and persons involved in decision-making on accepting the media.

Table 6: Test Results on Relationship between Study Plan and Persons Involved in Decision-Making on Accepting the Media

Study Plan	Persons Involved in Decision-Making on Accepting the Media					
	Friends	Family members	Famous people and celebrities	Most people in society	Non-existent	other
ordinary	99 (49.5)	13 (6.5)	3 (1.5)	37 (18.5)	41 (20.5)	7 (3.5)
vocational education	102 (51.0)	38 (19.0)	0 (0.0)	27 (13.5)	26 (13.0)	7 (3.5)
$x2$	20.220					
Sig.	.001					

Table 6 reports the Sig. value $(.001) < .05$, therefore rejected H0, accepted H1 at a significance level of .05, i.e., the study plans are different. Persons involved in decision-making on accepting public relations media are different.

6.4.4 Comparison of Satisfaction with Media Exposure Classified by Exposure time before Admission

Table 7: Results of ANOVA on Satisfaction with Media Exposure Classified by Length of Media Exposure before Admission

Length of Media Exposure before Admission	Frequency	Mean	S.D.	F-value	Sig.
1-3 months	39	4.41	.498	38.864	.00
3-6 months	131	3.95	.524		
6-12 months	194	4.56	.575		
More than 12 months	36	3.89	.523		
Total	400	4.29	.620		

Table 7 reports the Sig. (.00) < .05, therefore rejecting H0, accepting H1 at the significance level of .05, i.e., the length of exposure to public relations media before admission was different. The satisfaction with the exposed public relations media was different.

The researchers summarized the major findings as follows:

- The participating students considered websites as the first public relations media; they also used social media as public relations media, like Line, Facebook, Instagram at a high level.

- Their needs and motivations in media exposure were to obtain information for decision-making on a study program at the university of their choice. Friends enhance their confidence in selecting the media to reach a final decision. They were satisfied with

overall media exposure for high speed of accessing and receiving the target information.

Hypothesis results:

- Different genders and study plans didn't affect the types and channels of media exposure.
- Different genders, the media exposure period before admission application, different study plans didn't affect media exposure period before admission application.
- Different genders and different study plans, persons involved in media exposure decision-making were different (i.e., with effect).
- Different types of media and different channels of media exposure, satisfaction with media exposure were not different (i.e., no effect).
- Different media exposure periods before admission application, satisfaction with media exposure were different (i.e., with effect).
- Different persons involved in media exposure decision-making, satisfactions with media exposure were not different (i.e., no effect]

7. Discussion of Results.

With high expectation, high school students need reliable sources of information to choose a study program at the undergraduate level. Their behavior can be explained by the theory of media use and satisfaction with the process of exposure (Katz, Blumer & Gurevitch, 1974). The use of media by individuals or groups shows that media consumption depending on the needs or motivations of the information recipients themselves. These recipients have their own objectives, intentions and a desire to utilize the media to satisfy their own needs Studies on media use and media satisfaction (uses and gratification) indicate that people use mass media to meet their needs, know about events (surveillance) by tracking various movements and observations around them, stay up-to-date and learn what is important to know (McCombs & Becker,1979).

As seen in the findings of the study, the subjects were satisfied with the exposure to public relations media for the reason that they were able to get quick access to vast and up-to-date information. As known, media selection comes from the foreseeable predictions to guide the target audience toward useful information as a reward or a positive effect. A reward as a psychological effect generally results from media use or exposure that allows individuals to assign value to different reward outcomes. Satisfaction derived from the media is considered media gratification (Kaewthep, 2009).

The results of the study highlighted that the types of media and channels of exposure to public relations media did not seem to relate to satisfaction received from exposure to public relations media. This could stem from the condition that people have their intention in seeking information to be useful in some way. Therefore, the use of media is not an activity that is carried out without goals, but with a definite purpose (goal-oriented activity); the recipient seeks and chooses the available media in the direction the person wants as a primary cause in that type of media. In this regard, the needs of that person stands as the primary cause for the needs to be translated into incentives (motivation) that will drive people to move toward the use of different types of media (Kaewthep, 2009).

8. Recommendations

Based on the findings of the study, the researchers would like to recommend the following:

(1) Relevant student recruitment agencies can use the obtained results on high school students' perception of public relations media exposure to guide their strategies in contact with potential customers who might look for their study program at a particular university. They could prioritize the types of public relations media and educational activities as responsive to customers' needs. It is vitally important to improve the public relations media in a professional format to suit and attract the interest of potential customers or message recipients.

(2) Since this study dealt with female high school students in the central education district in Thailand, the points of investigation on the types of media and satisfaction with the exposed media could be studied further in other districts to get a large picture of high schools students using web or social media in decision-making on a study program.

9. The Authors

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Faculty Members' Perception of the Thai University Administration Model in the Digital Age

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Abstract

The objectives of this research were (1) to study the Thai university administration model in the digital age, (2) to compare the opinions of faculty members toward the Thai university administration model in the digital age, and (3) to propose the Thai university administration model in the digital age. The researcher used a questionnaire with IOC at 0.87 and reliability at 0.91 to collect data from 400 faculty members on a voluntary basis. The data were analyzed by percentages, means, standard deviation, t-test, one-way ANOVA, LSD and content analysis. The results were in three folds. First, the Thai university administration model in the digital age holds four aspects: (1) production of graduates, followed by (2) research, (3) academic services to communities and (4) promotion of Thai art and culture. Prompt actions are required for teaching via web/e-learning tools, accelerating teachers' development to create a new body of knowledge, and increasing online innovations. The policy and plans for the production of graduates in the digital age are the urgent matters of the university. Encouragement for the dissemination of more international research, involvement of the community to join the university as a digital society, and promoting digital citizenship in preserving Thai cultural traditions are to be recognized by the new generation and the world community. Second, the faculty members with different academic experiences and positions had different viewpoints statistically significant at .05 in overall and across all aspects of the model. Third, the proposed university administration model in the digital age has its focus on development of modern technology networks, digital media center, and digital skills development for faculty members, students and support personnel. Urgently needed is research into teaching materials development, obstacles in online learning and teaching, digital learning exchange activities, digital community involvement, and methods of authentic assessment and evaluation to cope with rapid changes in the years to come.

Keywords: *Thai university administration model, digital age, production of graduates, research, academic services, cultural promotion, community involvement*

1. Background of the Study

The university or higher education institution offers both undergraduate and graduate programs. The role of universities as repositories and generators of knowledge with the obligation to help graduates to enter the workforce with good employment, while serving as an academic arena for the government's public policy and social/ economic development, as well as representing influential bodies in civil society (Ministry of Education, 2014). In Thailand, the traditional missions and functions of higher education institutions are teaching and learning for producing graduates, researching, providing

academic services to communities, and promoting Thai art and culture. Higher education institutions are to play vital roles as social conscience builders in the rapid socio-economic transformation of Thailand in the last two decades (Kirtikara, 2001). Meanwhile Phosa (2016) asserted that such roles require good management for efficiency in the use of manpower to make active and responsible organizations. The coherent government policy with clear continuity in planning is required for practicality in implementation, supported by relevant morale and physical/ digital infrastructure development.

As known, the 21st century as the digital age uses the Internet technology in storing, linking, sharing and disseminating information via electronic media across universities. Universities need to provide education using digital media and skills. The main and auxiliary media are to support e-learning in addition to the face-to-face teaching and learning management system. Learning through electronic media take various forms, such as online, website, e-learning, multimedia, multi-application programs and platforms for real time meeting or non-real time in combination. Rennie & Morrison (2013) emphasized that students must learn and adapt to keep up with changes in teaching and learning, develop information skills by searching through the web, creating a webpage and responding to online assessments via quizzes after accessing their lessons from e-books, group blogs, podcasts, webcasts, YouTube, Wikis, Skype and Line. Learners are to possess fluency in three aspects. First, *technical skills* in the use of use computers and the Internet: word processor, web browser, email, communication tools to access and retrieve knowledge from online database via search engine and cloud computing. Second, *understanding context and evaluating digital* media to be able to make decisions about the nature of work and the effects of network technology realizations on behaviors, perspectives, beliefs and feelings toward the outside world for effective communication and coordination at work. Third, *creating contents and communicating them* through a variety of digital media tools. Creating digital media is more than just knowing how to use word processing programs or writing emails, but it means that media users are able to create, modify and share contents in specific contexts via blogs, images, videos, social media and other forefront platforms (Media Smarts, 2015).

Educators need to assess learners' achievement in terms of gained knowledge and abilities in various learning activities based on blogging or peer assessment. After a course of study, students can be tested by electronic measuring instruments both in the classroom and afterward. According to Schwartz & Arena (2009), quite a few researchers noted the role of digital technology in upgrading assessment to be smarter, faster, fairer and more effective. Assessment is a broad term that includes formative, summative and other types of assessment, particularly e-assessment and e-portfolio. However, an argument here is that through the social affordances of digital technologies, such as social media, blogs, wikis, e-portfolios and electronic voting for assessment, there should be opportunities to extend assessment challenges to aggregated, collective, crowd-sourced grading for learners to decide on artifacts to be used in assessment by particular assessors or evaluators. Such new assessment opportunities can empower learners' decision-making skills, which are important in preparing young people to participate effectively in a democratic society.

Considering from the changing learning style in the digital era, Thai universities need to adjust their administration to keep up with information technology disruptions. In this regard, the researcher would like to look for a workable administration model of Thai

universities in the digital age. The researcher noted that a desired Thai university administration model is confined with four dimensions or aspects prescribed by the government's national higher education policy on graduate production, research, academic services to communities, and promotion of Thai art and culture. The researcher would like to obtain viewpoints from higher education personnel on the administration model short- and long-term in planning and development. Preparation for human resources for the proposed administration model cannot do without upgrading digital learning management, provision of appropriate media, followed by research into current issues related to academic services and promotion of Thai art and culture.

2. Research Objectives

The objectives of this research were (1) to study the Thai university administration model in the digital age, (2) to compare the opinions of faculty members toward the Thai university administration model in the digital age, and (3) to propose the Thai university administration model in the digital age.

The researcher expected that the faculty members classified by (1) gender, (2) age (3) education level, (4) position, (5) experience (6) type of university should have different opinions on learning administration in higher education in the digital age.

3. Conceptual Framework of Administration Model of Thai University in Digital Age

The researcher developed a conceptual frame work for the Thai university administration model based on the government's policy as follows:

(1) A university is a community of faculty members, academics, administrators support personnel, and students, dedicated to learning, teaching to improve students' ability and quality. The traditional missions and functions of higher education institutions are teaching, researching, providing academic services to communities, and promoting Thai art and culture (Ministry of Education, 2014).

(2) The government also has a policy on ICT literacy for teachers and students at all levels of education in preparation for information technology disruptions. Digital technology can support educational changes, particularly in the administration process in teaching and learning management, research, academic services to communities, and promoting Thai art and culture. Bates (2016) emphasized learning conceptualization for ideal future citizens via digital technology, commonly known as Information Communication Technology (ICT).

(3) In Thailand, the government put ICT as the main driving force in digitally transforming the country's education and economy for a better future. Suchato (2017) emphasized the integrated information systems for modern education via networking and online courses.

4. Research Methodology

The participants in the study were 400 faculty members in public and private universities in Thailand, 200 for each type on a voluntary basis. The research instrument for collecting data was a questionnaire which was checked by three experts for its IOC value at 0.87 and reliability by Cronbach' alpha co-efficient at 0.91.

5. Data Analysis

As for data analysis, the researcher used percentages, means, and standard deviation, t-test, one-way ANOVA, LSD, and content analysis.

5.1 Thai University Administration Model in the Digital Age

The faculty member's opinions toward the Thai university administration model in the digital age were at a high level in total. In terms of process, the first aspect on the production of graduates by teaching and learning was at the highest level, followed by other three aspects: research, academic services to communities, and promotion of Thai art and culture, respectively. The details of four aspects are presented in Tables 2-5.

Table 1: Mean and Standard Deviation of Faculty Members' Opinions toward Thai University Administration Model in the Digital Age

Aspect	Process	$\bar{x}$	SD	Meaning	Series no.
1	Teaching and learning	4.50	.59	highest	1
2	Research	4.16	.56	high	2
3	Academic services to communities	3.67	.57	high	3
4	Promoting Thai art and culture	3.62	.67	high	4
	Total	3.99	.47	high	

The faculty members' opinions toward the Thai University administration model in the digital age were at the highest level in 6 items. The highest was "Teaching through web / e-learning tools." Those relatively lower items were "Accelerating the development of faculty members to create new knowledge and innovations," "Determining policies and plans for the teaching in the digital age as urgent matters of the university," "Conducting and using Information Communication Technology (ICT)," "Being classified as a full-scale Smart University" and "Faculty members using Flipped Classroom method." The results on 23 items in the aspect of the production of graduates or teaching and learning are shown in Table 2.

Table 2: Faculty Members' Opinions toward Thai University Administration Model in the Digital Age by Teaching and Learning

	Teaching-Learning Description	$\bar{x}$	SD	Meaning	Series no.
1	Determining policies and plans for the teaching in the digital age as urgent matters of the university	4.64	.58	highest	3
2	Conducting and using Information Communication Technology (ICT)	4.58	.59	highest	4
3	Accelerating the development of faculty members to create new knowledge and innovations	4.65	.57	highest	2
4	Being classified as a full-scale Smart University	4.57	.75	highest	5
5	Teaching through web / e-learning tools	4.70	.44	highest	1

	Teaching-Learning Description	$\bar{x}$	SD	Meaning	Series no.
6	Faculty members using Flipped Classroom method	4.53	.68	highest	6
7	Students studying via social networks	4.41	.85	high	
8	Students transacting with the university via electronic system	4.42	.77	high	
9	Using cashless payment	4.43	.59	high	
10	Making transactions via smart ID cards	4.41	.85	high	
11	Having online courses mixed with regular courses	4.41	1.00	high	
12	Promoting the administration of all parts of the university into the electronic system	4.46	.84	high	
13	Appropriate equipment to support learning activities in the digital age	4.47	1.02	high	
14	Having Intelligence Library with digital technology	4.47	.68	high	
15	Promoting teaching and learning activities through a variety of applications: Google classroom, class Start, Zoom, MS team, Line, WeChat	4.49	.59	high	
16	Developing an open education system for free, and sharing knowledge in the form of a large number of learners (MOOC=Massive Open Online Course) to facilitate learning in the digital age	4.45	1.02	high	
17	Providing sufficient budget for online teaching in the digital era	4.48	.68	high	
18	Emphasizing the organization of digital media in a concrete manner	4.49	.59	high	
19	Developing learners' high competencies and digital literacy (Media and Information Literacy or MIL)	4.47	1.02	high	
20	Developing university infrastructure to suit the digital age	4.49	.68	high	
21	Organizing IT personnel to give good IT services in the digital age	4.49	.59	high	
22	Continuously organizing training on skills in using modern technology	4.47	.80	High	
23	Developing information technology systems to facilitate various aspects of teaching and learning.	4.48	.59	High	
	Total	4.50	.59	highest	

As for the aspect of Research, the faculty members perceived at the highest level "Having research R to R, and developing more teaching materials." The other high-level items were "Creating a new body of knowledge to achieve the Thailand 4.0 policy," "Promoting research cooperation activities within the university," "Having more R & D research for teaching and learning in the digital age," and "Determining policies, research plans to create more digital knowledge both long-term and short-term," and "Encouraging the dissemination of more international research. The details are shown in Table 3.

Table 3: Faculty Members' Opinions toward the Thai University Administration Model in the Digital Age by Research

	Research Description	$\bar{x}$	SD	Meaning	Series no.
1	Having research R to R, and developing more teaching materials	4.52	.68	highest	1
2	Creating a new body of knowledge to achieve the Thailand 4.0 policy	4.46	.60	high	2
3	Promoting research cooperation activities within the university	4.38	.59	high	3
4	Having more R & D research for teaching and learning in the digital age	4.37	.67	high	4
5	Determining policies and research plans to create more digital knowledge both long-term and short-term	4.36	.67	high	5
6	Encouraging dissemination of more international research	4.35	.74	high	6
7	Gearing research studies in the direction of technology to promote sustainability	4.21	.77	high	10
8	Building a research network to access information to create more research innovation chains between universities in the country	4.26	.71	high	7
9	Supporting research studies in the area of sustainability	4.21	.77	high	10
10	Having research cooperation presentation of research results as a group of partner universities	3.79	1.06	high	12
11	Promoting more research activities through electronic media	4.21	.62	high	8
12	Promoting the preparation of information articles to support research dissemination	4.21	.70	high	9
	Total	4.26	.56	high	

Considering the aspect of Academic Services to Communities, the faculty members put at the highest level: "Organizing activities to open up the worldview and giving the community an opportunity to collaborate with the university in the digital society." The other high-level items were "Continuously promoting information about living in the digital age to the community through various media channels," "Organizing activities to raise awareness of digital citizenship in communities," and "Collecting information about the preparation of necessary digital skills of people in the community in the digital age." The results are shown in Table 4.

Table 4: Faculty Members' Opinions toward the Thai University Administration Model in the Digital Age by Academic Services to Communities

	Academic Services to Communities Description	**$\bar{x}$**	**SD**	**Meaning**	**Series no.**
1	Organizing meetings, seminars, exchange learning experiences in digital learning management	3.72	.83	high	8
2	Collecting information about the preparation of necessary digital skills of people in the community in the digital age	4.40	.59	high	4
3	Organizing activities to open up the worldview and giving the community an opportunity to collaborate with the university in the digital society	4.44	.67	high	1
4	Organizing activities to raise awareness of digital citizenship in communities	4.42	.59	high	3
5	Continuously promoting information about living in the digital age to the community through various media channels	4.43	.69	high	2
6	Providing advice on continuous innovation and technology changes to the community	3.84	.75	high	6
7	Strengthening adaptation to digital technology literacy	3.95	.94	high	5
8	Providing recommendations for preventing the negative impact of digital technology	3.58	.82	high	9
9	Creating a project for cooperation in a digital society between the university and the community	3.84	.99	high	7
	Total	4.07	.57	high	

The faculty members perceived all items of Promotion of Thai Art and Culture at a high level. the highest-level item was "Raising awareness of the continuation of the country's artistic and cultural traditions among personnel in all parts of the university." The other high-level items were "Collaborating with the organization and the community to carry on Thai cultural traditions in transferring them to the youth of the country through various media," together with "Organizing activities with local communities to honor good people in preserving Thai cultural traditions, and disseminate to the international community," "Promoting cultural exchange with foreign countries," and "promoting activities to preserve Thai art and culture in higher education via online media."

Table 5: Faculty Members' Opinions toward the Thai University Administration Model in the Digital Age by Promoting Thai Art and Culture

	Promoting Thai Art and Culture Description	**$\bar{x}$**	**SD**	**Meaning**	**Series no.**
1	Organizing meetings, seminars, exchange learning experiences for preserving art and culture in the digital age	3.65	.83	high	8
2	Promoting awareness of Thai identity in the digital age	3.88	.59	high	7
3	Promoting activities to preserve Thai art and culture in higher education via online media	4.00	.67	high	5
4	Promoting cultural exchange with foreign countries	4.03	.67	high	4
5	Expanding knowledge in arts, traditions, and diverse cultures to the world community through various media channels	3.98	.69	high	6
6	Disseminating folk culture to the global community in the digital age	3.54	.75	high	10
7	The university leading in preserving Thai art and culture to maintain continually in the digital age	3.55	.94	high	9
8	Raising awareness of the continuation of the country's artistic and cultural traditions among personnel in all parts of the university	4.43	.82	high	1
9	Collaborating with the organization and the community to carry on Thai cultural traditions in transferring them to the youth of the country through various media	4.42	.54	high	2
10	Organizing activities with local communities to honor good people in preserving Thai cultural traditions, and disseminate to the international community	4.26	.63	high	3
	Total	3.97	.67	high	

5.2 Results of Comparison of Faculty Members' Opinions toward Thai University Administration Model in the Digital Age

The results of comparison of faculty members' opinions toward the Thai university administration model in the digital age are shown in Tables 6-7.

Table 6 reveals that the total items of four aspects of the Thai university administration classified by gender and university type were not different. The aspects were statistically significant at the level .05 between administrator /non-administrator in Teaching and Learning and between Education MA and Ph.D. in the aspect of Research.

Table 6: Comparison of Faculty Members' Opinions toward Model of Thai University Administration Classified by Gender, Education, Position and University Type

Aspect	University Administration	Gender (Male/female)		Education (MA/PhD)		Position (Administrator /non-administrator)		University Type (Public U. /Private U.)	
		t	sig	t	sig	t	sig	t	sig
1	Teaching and learning	0.83	.41	-.66	.51	7.44*	.00	1.31	.19
2	Research	-0.32	.89	-3.03*	.00	-1.18	.24	-1.30	.18
3	Academic services to communities	-0.28	.77	.28	.77	1.14	.16	-.51	.61
4	Promoting Thai art and culture	-0.68	.66	- 16	.88	-1.13	.27	-1.32	.19
Total		-0.16	.90	-.87	.38	1.81	.07	-1.62	.08

*Statistical significance at level .05

Table 7 reports the results of the analysis of variance of total and individual aspects classified by Experience statistically significant at the .05 level. The results on pair comparison classified by Experience of faculty members ≥31 years show a higher mean than those with 6-15 years in total and individual aspects, those with ≤5 years in total and individual aspects of Teaching and Learning, Research, Academic Services to Communities and Promoting Thai Art and Culture.

Table 7: Analysis of Variance of Faculty Members' Opinions toward Thai University Administration Model in the Digital Age Classified by Experience

Aspect	Strategies	Sources of Variance	SS	df	MS	F	Sig
1	Teaching and learning	between group	27.679	3	9.226	32.834*	.000
		within group	111.21	396	.281		
		total	03.741	399			
2	Research	between group	9.002	3	3.001	16.084*	.000
		within group	73.938	396	.187		
		total	82.965	399			
3	Academic services to communities	between group	2.268	3	.756	3.124*	.009
		within group	95.748	396	.242		
		total	98.574	399			
4	Promoting Thai Art and Culture	between group	11.020	3	3.673	8.893*	.000
		within group	163.475	396	.413		
		total	200.676	399			
	Total	between group	7.297	3	2.432	11.863*	.000
		within group	81.102	396	.205		
		Total	88.699	399			

*Statistical significance at level .05

6. Proposed Thai University Administration Model in Digital Age

Based on the obtained results from the questionnaire and content analysis of additional comments given by the participating faculty members, the Thai University Administration Model in the Digital Age proceeds with the four major aspects as prescribed by the government: (1) The Production of Graduates or Teaching and Learning, (2) Research, (3) Academic Services to Communities, and (4) Promotion of Thai Art and Culture. As for the aspects of Teaching and Learning, and Research, the participating faculty members focused on a modern digital media center in short- and long-term planning, development and implementation. Long-term development of digital skills for faculty members, support personnel, and students in all work units and MOOCs to assist teaching. They also prioritized knowledge management (KM) and funded action research to (1) support creation of appropriate teaching materials, (2) identify problems and obstacles in online teaching and learning management, select teaching techniques, assessment/ evaluation methods to cope up with rapid changes in students' demands for autonomous learning management. In the aspect of Academic Services to Communities, the faculty members requested mutual support and assistance for activities to be arranged

for target communities as guided by the government's National Plan on Social and Economic Development. Digital technology definitely serves as the main tool in communicating and disseminating knowledge and activities the Thai universities want to impart to communities and society at large. Exchanged learning about digital literacy as well as preservation of Thai art and culture via appropriate media and through artistic/ cultural events should deserve attention of the public for sustainability in the long run.

7. Conclusion of Results

The major results of the study were concluded as follows:

7.1 The participating faculty members viewed the Thai University Administration Model in the Digital Age regarding its total and individual aspects at a high level. The highest was the aspect of Production of Graduates or Teaching and Learning. The other three aspects followed in importance: Research, Academic Services to Communities and Promoting Thai Art and Culture.

7.1.1 Teaching and Learning had six items at the high level; the highest mean was the "Teaching through web/ e-learning tools." The other high-level items were "Accelerating the development of faculty members to create new knowledge and innovations," "Determining policies and plans for the teaching in the digital age as urgent matters of the university," Conducting and using Information Communication Technology (ICT)," "Being classified as a full-scale Smart University," and "Faculty members using the Flipped Classroom method."

7.1.2 According to the faculty members' perception, the aspect of Research carried the highest mean of the item on "Having research R to R, and developing more teaching materials." They expected teaching and learning activities through various applications, such as Google Classroom, Class Start, and Zoom meeting." The other high-level items were "Promoting research cooperation activities within the university," and "Having more R & D research for teaching and learning in the digital age." They preferred contents in teaching and learning that emphasize students' awareness of morality and experience enhanced by ICT. Through research, teachers should be able to handle online courses and develop modern teaching materials as pertinent to students' needs.

7.1.3 Academic services to communities had the highest mean of the item "Organizing activities to open up the worldview and give the community an opportunity to collaborate with the university in the digital society." The other high-level items called for involvement of people in communities in the use of various media and channels, their awareness of digital citizenship in communities and necessary preparation of digital skills.

7.1.4 Promoting Thai art and culture had the highest mean of the item "Raising awareness of the continuation of the country's artistic and cultural traditions among personnel in all parts of the university." The other high-level items involved collaboration with the organization and the community to preserve Thai traditions and culture through

various media, to honor good people as models for the local and international community as part of cultural exchange among higher education institutions.

7.2 As for the comparison of various items under four major aspects, there was a statistical significance at level .05 in the total aspect of the Thai university administration model, but those classified by gender and university type were not different. There was statistical significance at level .05 between Administrator /non-administrator in Teaching and Learning, and between the education levels MA and Ph.D in the aspect of Research. The total and individual aspects when classified by experience was statistically significant at the .05 level. The faculty members with experience ≥31 years had a higher mean than those with 6-15 years in total and individual aspects, and those with ≤5 years in total and individual aspects of Teaching and learning, Research, Academic services to communities and Promoting Thai art and culture.

7.3 The proposed Thai university administration model in the digital age has its focus on the production of graduates or teaching and learning. What is urgently required falls on the use of network, a modern digital media center, short- and long-term development of digital skills for all groups of university personnel. MOOCs and funded research into teaching materials development should deserve priority in planning, development and implementation. Academic services to communities require involvement, participation and mutual support and assistance from those concerned. It is obvious that digital technology plays a vital role in all four aspects of the Thai university administration model and the aspect of Promoting Thai Art and Culture is no exception. Cultural exchange can help Thai art and culture survive in the home society and the international arena. The university should disseminate and expand knowledge of Thai culture through various media channels for preservation and continuation.

8. Discussion of Results

This section deals with discussion of three major findings as follows:

8.1 The aspect of the production of graduates or teaching and learning is in fact the main role of the university prescribed by the Thai government, and the faculty members appeared to agreed accordingly upon the assigned function. To them, it was not a surprise to be guided along the digital trend in teaching and learning, research, academic services to communities, and promoting Thai art and culture. Faculty members need to be able to handle web / e-learning tools and online innovation as an urgent matter of the university. This point was earlier discussed by Suchato (2017) in that the role of faculty members in the use of teaching tools, such as web and e-learning to communicate with students in class (class communication), and management (organizing) for required documents. School supplies (materials), evaluation measurements (assessments), and other accounts (rosters) can create teaching activities through a variety of applications; the most frequently used is Line, followed by Google Classroom and Zoom. Some scholars suggested online teaching design to provide students with easy access to resources, and asserted that interaction between learners and teachers in a simple and diverse manner will account for success in online teaching (Athanasu, 2009; Schwatz & Arena, 2009; Pineida, 2011; Ghavifekr et al., 2015; Jindanuruk, 2016).

8.2 The results on the compared aspect items were significantly different at the .05 level in total in Teaching and Learning when classified by position, and Research classified by the education levels MA and PhD and experience. When classified by Experience, the faculty members with ≥31 years had higher mean than those with 6-15 years in total and all aspects, those with ≤5 years in total and aspects of general management and educational evaluation, and those with 16-30 years in educational evaluation and research. As pointed out in the study by by Banoobhai (2017), faculty members who started their teaching career early are able to accumulate their research skills and obtained academic ranks rather early as well.

8.3 The proposed Thai university administration model emphasizes teaching and research with the use of digital skills. Faculty members value Internet technology, use of electronic media and channels not only for their academic work, but benefits for their students, as shown in MOOCs, and activities arranged as academic services to communities and art and cultural events for preservation and continuation. Such mutual benefits were studied by Odora & Matoti (2015) who pointed out that lecturers perceive their new roles in the digital age by using computer-based technology and other digital technologies for their work both in and out of the classroom. Rennie & Morrison (2013) emphasized that it was important to improve students' digital literacy and skills to enable them to search through the web, create a webpage, and handle online assessment and quizzes. They need to familiarize themselves with the use of Blog, Podcast, Webcast, Wiki, YouTube, Skype, and LINE groups, and other relevant applications. In this regard, one major government university in Thailand conducted research into digital literacy and skills and concluded that graduate students require digital skills for the knowledge-based economy and deep knowledge learning (Ministry of Education, 2014). This point was supported by Kiss (2017) who said that digital skills are required of modern learners to search, collect, process, and use information systematically, able to assess the connection and distinguish reality from the virtual world. Certainly, the aspect of Research cannot do without digital literacy and skills for a researcher to complete a systematic inquiry on the basis of obtained information and needed data.

9. Suggestions

The researcher would like to see Thai university administration takes a prompt action on developing their academic staff members to use digital skills and networks for their teaching and learning management to meet the current needs of their students. Undoubtedly, leadership from the university authorities concerned determines speed in the direction of digital competencies as a dominant part of their personal lives, their teaching and learning management, support and facilitation for their work in research, academic services and activities/ events arranged for target communities as planned. It is without doubt to academics and support staff members that going digital is a necessity to survive in their university career, and no longer as an option.

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11. The Author

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Medical Image Data Conversion to Design Anatomical 3D Models for Creative Medical Applications

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Abstract

This academic paper reports a practical guide to creating an anatomical 3D design using medical image data conversion techniques and examines the creative purposes of using anatomical 3D models in the medical field. Anatomical 3D models are regularly used in clinical training, diagnoses, and surgical planning for physicians. The creation of anatomical 3D models has required accuracy of size, scale, and proportion of anatomical data. Hence, the technology in medical imaging, such as CT scan and MRI, is used to capture precise anatomical data from patients. However, the anatomical images dataset from CT Scan and MRI are only two-dimensional and require further processing to convert the file to a 3D model. Two different medical image file formats are generally used in healthcare, namely PACS and DICOM. This paper has demonstrated the features of the DICOM file format that contained better references data, such as slicing thickness, spacing between slices, and converting image resolution to a 3D Model. The methods to convert DICOM to STL file format also require specific techniques to handle the automatically generated function from open-source programs with lower image quality. The author described the improvement techniques by using Materialize Mimics software to adjust parameters and selected tissue surfaces before conversion to Stereolithography (STL) file. With the STL file format, physicians can edit and design the 3D models to achieve objectives and use anatomical 3D models for other creative purposes.

Keywords: *Medical image data, 3D Design, anatomical model, 3D printing, Computer-Aided Design, Rapid-Prototyping, CT Scan, PACS, DICOM, STL*

1. Introduction

Anatomical 3D models are three-dimensional materials created as replicas of organs that represent structures of particular systems, either partly or entirely of human or animal anatomical features that are easy to view and convenient for learning of medical personnel. There are many purposes of medical 3D models, depending on the underlying objectives of their uses; for example, using medical models as learning media that can represent anatomy. This model could be enlarged, as the organs can be too small and cannot be observed by the naked eye. Alternatively, it can design to reduce the size to represent specific anatomical parts with more significant components (Edelmers, Kazoka & Pilmane, 2021).

Traditionally, 2D measurements were used to assess medical images. Unfortunately, it is difficult to know which slice should be measured, and since organs are irregularly shaped, there is no point in taking a 2-dimensional measurement. Likewise, 3D imaging has

allowed for more multifaceted volume measurement and monitored anatomical position more accurately. Hence with elevations and precise positioning, the physicians can access vital data to help identify the patients' diagnosis easier. The physical interaction with anatomical 3D models endorsed learning anatomy, and differentiated structures interact spatially in the body in the clinic. This method can reduce the risks of surgical interventions by training with 3D surgical simulation models, which requires accuracy of size, scale, and proportion of anatomical data. The accuracy of anatomy can be generated from medical image data. The CT scan and MRI are widely used to image biological features, ranging from whole-body imaging to particular areas of interest and tracking and generating accurate scale and proportion (Bucking et al., 2017).

Recent advanced technology in software segmentation has made it increasingly easy to convert the surface of structures of interest from medical imaging data to three-dimensional (3D) forms and create anatomical models using a personal computer with prior anatomical knowledge by computer software, i.e., Materialize Mimics (Bucking et al., 2017).

The study presents an improved method for reconstructing the shape of 3D objects from 2D DICOM datasets generated from Materialize Mimics software. The focus is on DICOM data processing based on digital image processing techniques to get a 3D point cloud, reconstruct the 3D object based on triangulation of 3D point clouds, and build an application for rendering and visualizing the 3D medical image objects. The proposed method is expected to serve best in creating a 3D object from DICOM images.

2. The Different Medical Functions of PACS and DICOM format

Generally, a diagnosis of medical image data is a cooperative process where radiologists and medical doctors are involved. A radiology technician carries out all tasks that involve the localization and initial arrangement of the 2D images. The preparation includes affixing images on the lightbox so that a diagnostic process is supported optimally. This process is based on a series of actions performed to arrange images for optimal softcopy viewing, so-called 'hanging protocols.' The term initially referred to the arrangement of physical films on a lightbox. In either application, the goal of a hanging protocol is to present specific types of diagnosis regularly and reduce the number of manual image ordering adjusted and performed by the radiologist. A standard method for a hanging protocol for CT scans and X-ray images is lateral and frontal images scan. Even though CT scans often comprise the complete body, the clinician often only requires a small sub-volume of a scan (Berkowitz, Wei & Halabi, 2018).

PACS (Picture Archiving and Communication System) is a medical imaging technique commonly used in healthcare organizations to store and digitally transmit electronic images and clinically-relevant reports securely. PACS eliminates requirements to file manually, retrieve, store, film, report, and send information. Medical documentation and images can be securely recorded in distance databases and safely accessed from anywhere using PACS software, workstations, and mobile devices. PACS systems can archive medical image files received from scanning and photographing hardware, e.g., CT Scan, MRI. However, they are limited in functions and metadata. That is why physicians tend to use DICOM, which can be used as a communicative platform that includes information stored within PACS systems (Berkowitz, Wei & Halabi, 2018).

DICOM (Digital Imaging and Communications in Medicine) is an international standard platform for communicating, managing, and transmitting medical images and related data. It contains the interoperability of systems used to produce, store, share, display, send, query, process, retrieve and print medical images, and manage related workflows. DICOM and PACS are related applications but different technologies. DICOM acts as a file format and the international communication standard. Otherwise, PACS transfers medical images data. With advanced imaging technologies and the increasing use of computing in clinical work. DICOM is used widely to store, exchange and transmit medical images. They were especially enabling to integrate with medical imaging devices from multiple manufacturers. Patient data and related images can be exchanged and stored in a standard format instead of interpreting multiple image formats between different imaging devices. Hence, physicians have easier access to images and reports with the DICOM standard, allowing more comprehensive diagnoses. Images in the DICOM format have metadata or references for each slice, including the thickness, spacing between slices, and image resolution. Currently, the reconstruction of 3D images is performed by stacking DICOM images according to their metadata (Kamio, Suzuki, Asaumi & Kawai, 2020).

Consequently, the reconstruction success depends on the accuracy of the DICOM images and their metadata. Images in the DICOM format can be converted to their 3D form by proposing and selecting tissues from various 2D segmentation. The current reconstruction method of 3D images from DICOM files requires a technique for the reconstructed scanned images to have the same metadata: slice thickness, spacing between slices, and image resolution. Standard slice thickness of DICOM file requirements depends on the complexity of the anatomy. Models used for dental and surgery often use data reconstructed from slice thicknesses of 0.5-1 mm, whereas models of long bones and the pelvis can use slice thicknesses up to 2 mm (Marro, Bandukwala & Mak, 2016).

3. The Methods to Convert DICOM to STL File Format

The general 3D file format conversion is Stereolithography (STL) file format, the most commonly used Computer-Aided Design (CAD) format for 3D Models, especially 3D Printing. The STL file captured geometry as a triangular mesh but contained no color or texture information within the file. There are two different ways of STL data storage, namely, binary encoding and ASCII encoding, which contained exact information, but the binary format is more compact and produces a smaller file capacity (Hwang, Jung & Cho, 2018).

Numerous open-source and proprietary software programs are available for converting a patient's DICOM data set to Stereolithography (STL) file format. Commonly used open-source programs included OsiriX and MeshLab (Marro, Bandukwala & Mak, 2016). However, the automatic open-source DICOM conversion to the STL file is generally inaccurate. The STL file may contain scraps and unnecessary surfaces, making it difficult to edit and erase in the CAD software. Proprietary-software programs, such as Materialize Mimics has built-in presets for bone and soft tissues by selecting different density layers by applying density parameters in the program. The software can also edit the 3D mask and make changes by removing unwanted pieces and cropping the unwanted areas. Once the mask is edited, the software will calculate the 3D object from the mask. The 3D object can further be exported into 3Matic for additional changes, or exported as an STL file format.

After improvements of the data in Materialize Mimics software, the exported STL file is still required for editing in proprietary 3D CAD software again to enclose the surfaces of the 3D model. For this method, the researcher has recommended using Zbrush Software. Pixologic ZBrush is an advanced 3D sculpting program that uses digital sculpting tools that mimic traditional sculpting techniques. The method of sculpting in ZBrush is similar to shaping with a form of clay. The sculpting tools from ZBrush allow a wide range of creative freedom. Not only able to create more organic and detailed models, the program can often arrive at the finished product faster than other 3D programs like Maya or 3ds Max. By using Zbrush, designers can enclose the surface of the 3D model in detail and edit the mesh of the anatomical model easier. However, a limitation of Zbrush is the software interface that does not show measurement guidance in the program, making it very difficult to edit the 3D model according to the given dimension. As mentioned earlier, if the design is required to edit the 3D model to the exact size. The STL files are further needed to adjust in other CAD programs, such as Rhinoceros 3D that has measurement guidance or ruler tabs.

4. The Further Creative Purposes of Using STL Anatomical 3D Models

Stereolithography is a solid freeform technique (SFF) that was developed by 3D Systems in 1986. Whereas many other formats were developed since then, the STL file format has remained one of the most versatile solid freeform techniques. This technique has the highest fabrication accuracy, and an increasing number of materials that can be processed are becoming available. Solid freeform fabrication techniques have initially been developed to create prototypes for purposes of designing products. (Khatri, Frey, Raouf-Fahmy, Scharla & Hanemann, 2020) Traditional anatomical model prototyping methods involve handcrafted mold making and casting techniques. On the contrary, the ability to create an object within hours from a Computer-Aided Design by Rapid Prototyping (RP) significantly speeds up the production of 3D models. Rapid Prototyping using SFF techniques is a common practice in the industrial design, automotive industry, jewelry making, and designing end-user devices and appliances (Melchels, Feijen & Grijpma, 2010).

In the field of medicine, the Rapid Prototype has been introduced when compared to its long-standing use in various engineering applications, and so numerous researchers have reported the influence of anatomical 3D models and rapid prototype technology in various areas of the medical field: (1) Surgical Planning**,** (2) Customized Prosthesis Design, (3) Medical Education and Training, (4) Virtual Reality (VR) and Augmented Reality (AR) in Health Care, and (5) Bioprinting. The details are given below.

(1) Surgical Planning

The rapid prototype medical models have been developed to use in surgical planning, as these models provide the visual aid that can be used by physicians to plan for surgery, and by surgical teams to study the anatomical structure of patients before the surgery. These models can help decrease surgery time and risk during surgery, predict problems during operation and facilitate diagnostic quality. The rapid prototype medical models enable physicians to rehearse complex procedures and better understand the complex anatomy. Hence, these models are beneficial in surgeries, especially where there are anatomical abnormalities and deformities (Sharma, Dhiman & Negi, 2014).

(2) Customized Prosthesis Design

The rapid prototype medical models are able to fabricate customized prostheses and fixtures due to the inherent strength of this technology, and to fabricate complex geometry within a very short time. The combination of medical imaging technologies makes it possible to manufacture customized prostheses and fixtures that precisely fit a patient at a reasonable cost. Such combination allows the physicians to create accurate implants for their patients rather than the use of standard-sized prostheses that do not completely fit with patients (Sharma, Dhiman & Negi, 2014).

(3) Medical Education and Training

The anatomical 3D models can clearly demonstrate human anatomy's external and internal structures in colors. Thus, these models can be used as teaching aids in research, medical education, and museums for educational and display purposes. Moreover, medical practitioners can use these models to better understand the problems or surgical procedures without causing discomfort to the patients (Sharma, Dhiman & Negi, 2014).

(4) Virtual Reality (VR) and Augmented Reality (AR) in Health Care

Healthcare services are improving their customer experiences by effectively engaging them in Virtual Reality (VR) and Augmented Reality (AR) technologies in health care activities. Health care specialists can evaluate their ability to facilitate realistic simulations of complex procedures in support of surgical planning, training, medical education, and communication in order to plan the sequence of procedures for their patients. For this reason, patients are able to understand the diagnosis better and get actively engaged in their treatment.

(5) Bioprinting

Bioprinting technology allows the precise placement of cells, biomaterials, and biomolecules in spatially predefined locations within confined three-dimensional structures. This technology emerged as a powerful tool for building tissue and organ structures in tissue engineering. This technique is required in combination with medical imaging, such as MRI and CT Scan and conversion to STL file format, all of which have developed into a broadly applicable technique for biomedical engineering purposes Melchels, Feijen & Grijpma, 2010).

5. The Future of Anatomical 3D Models: Artificial Intelligence (AI), Machine Learning (MI), Cloud Computing and Beyond

With the advancements in computing power, connectivity, and better-integrated sensors, Artificial Intelligence (AI) and Machine learning (ML) complement the work of physicians to enable the development of new treatment paradigms by improving and learning to recognize patterns of disease features. All of these are the potential to improve clinical outcomes and enable patients to be treated promptly (Alexander, McGill, Tarasova, Ferreira, & Zurkiya, 2019).

Artificial Intelligence (AI) and Machine learning (ML) technology are automation technologies that can convert anatomical 3D models to 3D models faster. These technologies can be integrated in use for recognizing patterns that can be applied to medical images with the algorithm system computing the image features that are believed to be important in making the prediction or diagnosis of interest.

With remarkably enhanced computing power, communication and cloud storages in medicine have received good attention from all users concerned. Cloud Computing refers to accessing computing resources through the Internet with the capacity to act on the data with computational algorithms and software packages. This technology provides flexible and scalable computing resources from remote locations. The other potentials of the increasing use of cloud computing in medical imaging are raw data management and image processing and sharing, which require high-capacity data storage and medical image processing benefiting from access to cloud computing. This technology enables physicians to manage the needed medical data in distance (Kagadis et al., 2013).

6. Conclusion

As stated in the purposes of this paper, the author would like to show a practical guide to creating an anatomical 3D design using medical image data conversion techniques and examines the creative purposes of using anatomical 3D models in the medical field. The features of the DICOM file format were explained that they contained better references data, such as slicing thickness, spacing between slices, and converting image resolution to a 3D Model. The methods to convert DICOM to STL file format were shown to handle the automatically generated function from open-source programs with lower image quality. The author described the improvement techniques by using Materialize Mimics software to adjust parameters and selected tissue surfaces before conversion to Stereolithography (STL) file. Physicians can use the STL file format to edit and design the 3D models to suit their purposes.

This paper also reports that in recent years advances in computing technology, 3D printing, and Artificial Intelligence (AI) technologies have revolutionized the medical world. The three-dimensional anatomical models produced by medical image processing have been used primarily in medical education. Medical practitioners can also familiarize themselves with the anatomy before performing a procedure, especially in surgical cases. Several models can be replicated in large quantities for students to be used during practical classes and allow specialists to review normal and abnormal anatomical structures. Likewise, the 3D models can also describe diagnosis and conditions to patients, not particularly for medical practitioners. Physicians also can educate health care consumers on better care about their health using the three-dimension model.

It should be noted that the conversion of patients' medical imaging to anatomical 3D models has recently gained popularity in healthcare and medicine. They can already provide high-quality assistance to doctors and medical specialists in treatment which has been proven to facilitate, decrease time consumption and improve the quality of surgical procedures by planning and optimizing surgical approaches.

In order to create effective anatomical 3D models, physicians and medical specialists still need experiment techniques to generate the form, for recently, there have been no prompted devices that can automatically generate medical imaging data to anatomical 3D models. The making of 3D processes is time-consuming and requires delicate design processes. Engineers and scientists are now developing the concept of generating medical imaging data to anatomical 3D models using cutting-edge technologies.

As in the near future, the uses of Virtual Reality (VR) and Augmented Reality (AR) are increasing along with Artificial Intelligence (AI) and Machine learning (ML). These technologies will be able to integrate and possibly can deliver effective anatomical 3D models in a short time. These will enable physicians and medical specialists to use patient's 3D model along with the software interfaces, or even collecting pathology data from patients and diagnosis by cloud computing. The technologies are now in progress in adoption and adaptation in health care, and many medical entrepreneurs are currently investing in digital health care solutions for the future and beyond.

7. The Author

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The Use of Algorithm System Model in Teaching English to Thai Students

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Abstract

At present, artificial intelligence technology has been used in English teaching in Thailand in support of learners' performance. In this study, the researcher aimed to (1) develop an algorithm system model for teaching English as a Second Language (ESL) to Thai students at the lower secondary level, and (2) study the effect of the algorithm system model on Thai students' learning outcome under study. The study was a quasi-experimental research using a pre- and posttest (One Group Pretest-Posttest Design) with lower secondary students. The research tool was an algorithm system model developed for teaching English to the students under study. The tool quality was obtained with a reliability coefficient of 0.97. The results showed that the learning outcome of the students from the algorithm system model in the posttest was higher than that in the pretest, and both overall and in all individual aspects were significant at the 05 level.

Keywords: *Algorithm system model, artificial intelligence technology, teaching English as a Second Language (ESL), lower secondary Thai students*

1. Introduction and Rationale of the Study

At present, artificial intelligence technology (AI) has been increasingly used to develop learning outcome via the computer system. The use of artificial intelligence in educational activities increased by 80% in 2021. The positive impact of AI was shown in learner learning (Russell, 2010). Through learning and human decision-making methods, AI plays an important role in English learning and affects many aspects of learning outcomes shown by Thai students. Most of them listen, speak, read, and write English in class by teachers' instruction. It was noted that 75% of English teachers' English skills in primary schools are problematic in rather ow proficiency at A2 or less in the CEFR Test.

The problems in English teaching in Thailand appear to lie in the lack of integrated skills in teaching and learning (Office of the Education Council, 2017). The emphasis on grammar and vocabulary teaching leads to students' inability to use English in communication. Although efforts are made to hire foreign teachers or native speakers of English, most schools cannot maximize the use of those hired teachers to help students communicate effectively. Students have to seek tutorial classes on their own with support from their parents. Students from middle- or working-class families have a limited opportunity in upgrading their language performance in real language interactions. Some schools have tried some teaching management methods to help students, but a large-size class in provincial schools has hampered students' learning motivation to a certain extent. Eighty percent of primary school English teachers are not English majors and as a result lack language skills to do communicative teaching.

Considering these problems, the researcher would like to investigate English language teaching at the lower secondary level with the use of AI for the reason that the algorithm system model should be tried at this level prior to its extended use at the higher levels.

The researcher also would like to look at teachers' attitude toward English teaching in basic education. Education statistics show that 51.91% of teachers assumed that have improved their English language ability through professional training programs organized by their school and the Basic Education Office (Office of the Education Council). Teachers expected their school to take care of curriculum development and provide guidance for teaching plan, teaching material production, and management of teaching media. However, most English teachers had to handle all these tasks and feel overwhelmed with other additional school duties. In this regard, teachers lack systematic support and AI could serve their needs for assistance in teaching and training students to communicate at the functional level. AI can help teachers manage students' learning and consultation. AI helps create English teaching content, such as checking correct grammar in the teaching content. Only one computer with a high-performance can be available to students to learn at the time they prefer and reduce restrictions in getting help from their teachers. AI is meant for teachers to share responsibilities with students, and teachers can encourage students' positive learning attitude and autonomy.

2. Research objectives

The researcher aimed at two objectives:

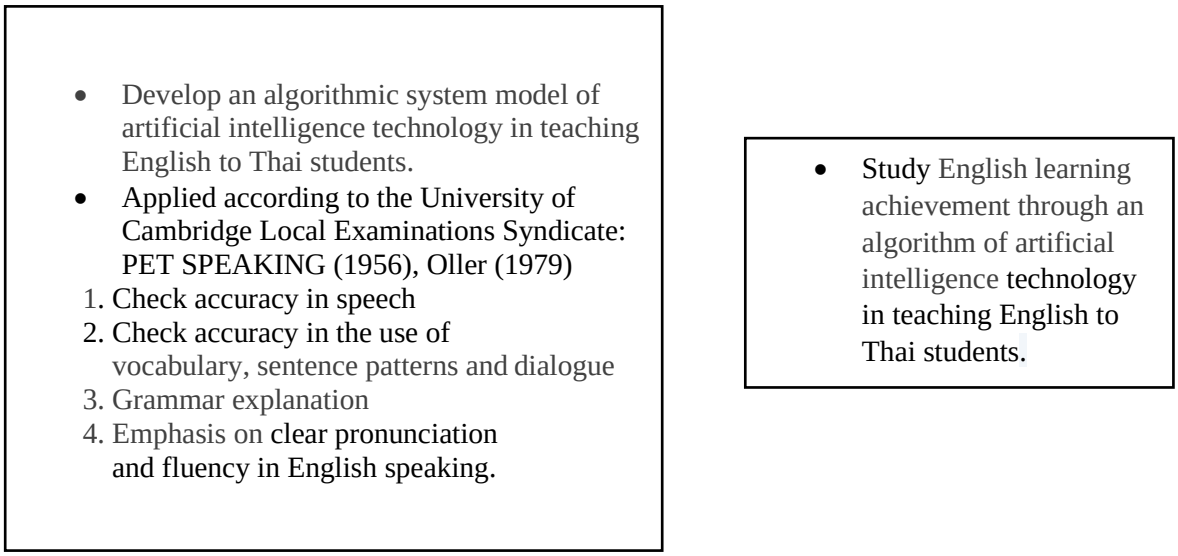
(1) To develop an algorithm system model for Teaching English as a Second Language (ESL) to Thai students at the lower secondary level, and

(2) To study the effect of the algorithm system model on Thai students' learning outcome under study.

3. Research Conceptual Framework

From the concepts, theories and related research in artificial intelligence technology, the development of algorithms in teaching English has become the focus of attention among language teachers. The concept of computer learning theory by machines can predict the learning outcomes by logics and the learning pattern can be generated from the data obtained (Hosch, 2009; Russel, 2010; Tatum, 2012). Teaching English focuses on the processed learning of natural language stored on large-scale and artificial neural networks, known as algorithms. The research conceptual framework is shown in Figure 1.

Figure 1: Research Conceptual Framework



The researcher used two steps in conducting this study:

Step 1: Develop an algorithm system model in teaching English to Thai students

The researcher studied previous research in AI from the literature regarding theoretical concepts about algorithm systems and artificial intelligence technology. The literature dealt with patterns of recognition and the theory of computer learning by which machines predict the results of learning by themselves; the patterns are derived from the data obtained (Hosch, 2009; Russel, 2010; Tatum, 2012). English teaching focuses on the processed learning of natural language; this can be done by artificial neural networks, known as algorithms. The researcher therefore would like to develop an algorithm system model to teach English as a Second Language to Thai students at the lower secondary level to see how they react to the system with specific learning outcome.

There were three stages involved in the development of an algorithm system model. First, the researcher constructed the tool on the algorithm system with specifications of contents and learning outcomes. The tool was checked by ESL specialists for accuracy and suitability for revision to reach the final version. Second, the researcher collected data on the aspects of (1) Identify what you need from an expert, that is, accuracy in speech, (2) correctness of vocabulary, sentences and dialogues, (3) explanation of grammar, and (4) clear pronunciation and fluency in English speaking. Third, the researcher analyzed the recorded results to draft a pretest/ posttest on the four aspects, and make revision as suggested by ESL specialists for the final version. The researcher also prepared tools for measurement and evaluation of the expected learning outcomes.

Step 2: Study the results of an algorithm system model in teaching English to Thai students

Step 2 dealt with the identified problems in the four aspects on speech accuracy, correctness of vocabulary, sentences and dialogues, explanation of grammar, and clear pronunciation and speaking fluency. Verification, testing was conducted for effectiveness of the algorithm system in teaching English to Thai students. There was a pretest plan in one group before and after the test (One Group Pretest-Posttest Design).

The subjects in the study were lower secondary school students at Wat Nuan Noradit School. They were randomly selected by lottery from schools under the Secondary Educational Service Area Office 1 in the second semester, Academic Year 2020.

The pretest and posttest on trial consisted of 40 items on understanding of sentence structure and English vocabulary with a score of 1 for a correct answer, 0 for a wrong answer. The obtained results were used as feedback in the development of an algorithm system model in teaching English to Thai students at the lower secondary level.

4. Results of the Study

4.1 The Development of an Algorithm System Model in Teaching English to Thai Students

The researcher reported the sequence of steps used in the algorithm system model as shown in Figures 2-4.

Figure 2: Development of an Algorithm System Model in Teaching English to Thai Students (1)

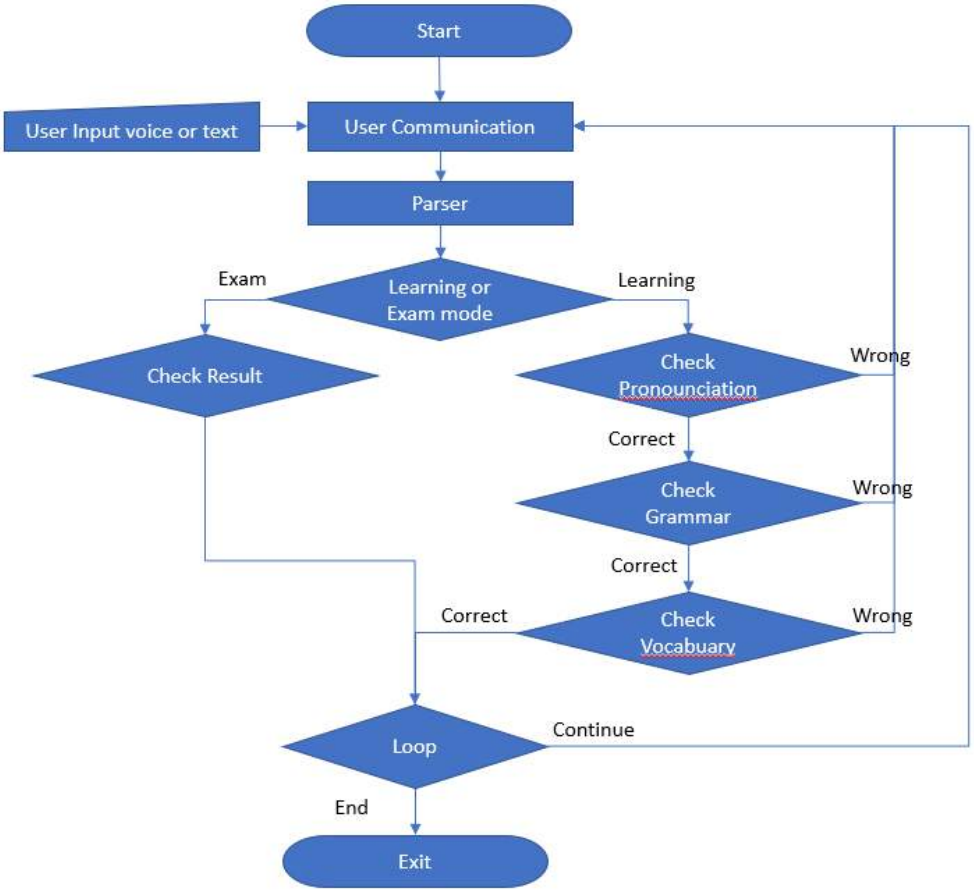
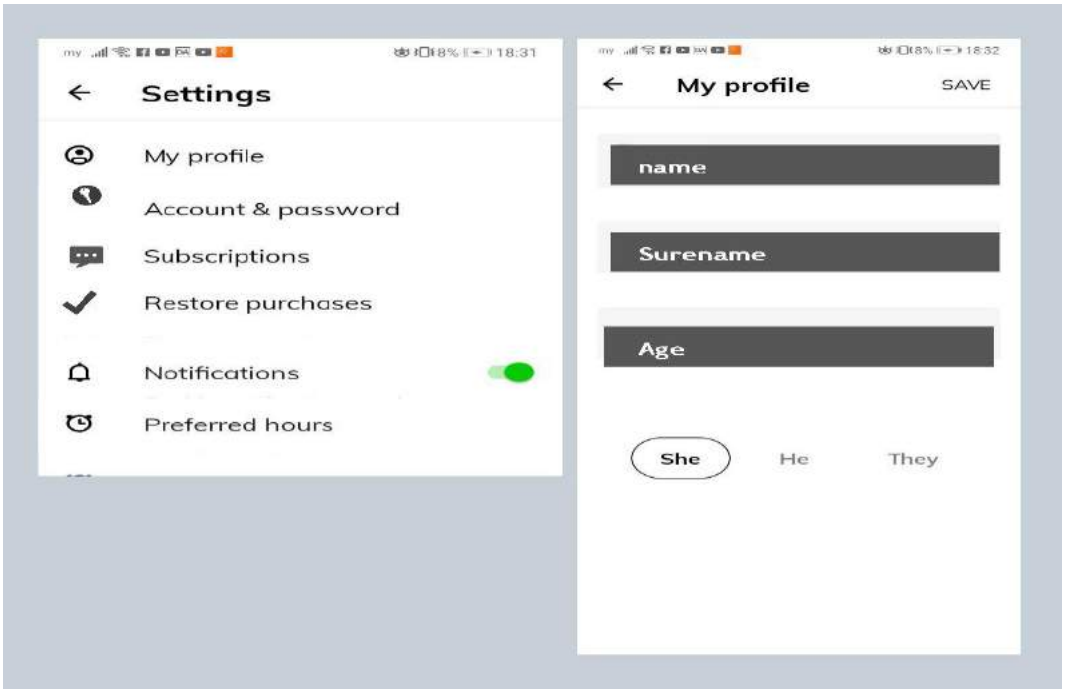
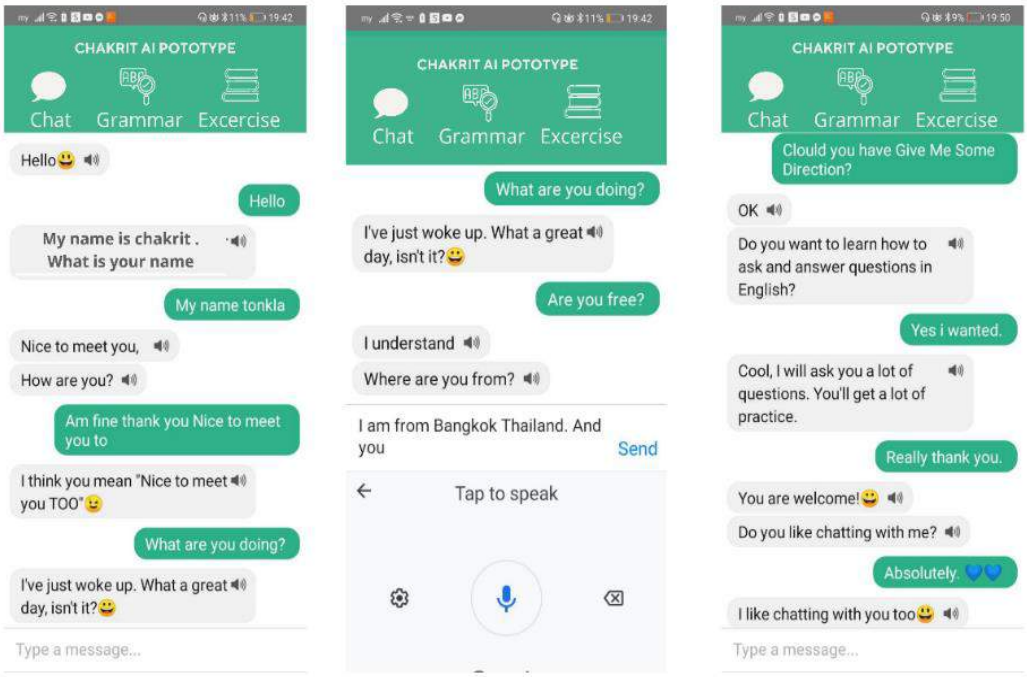


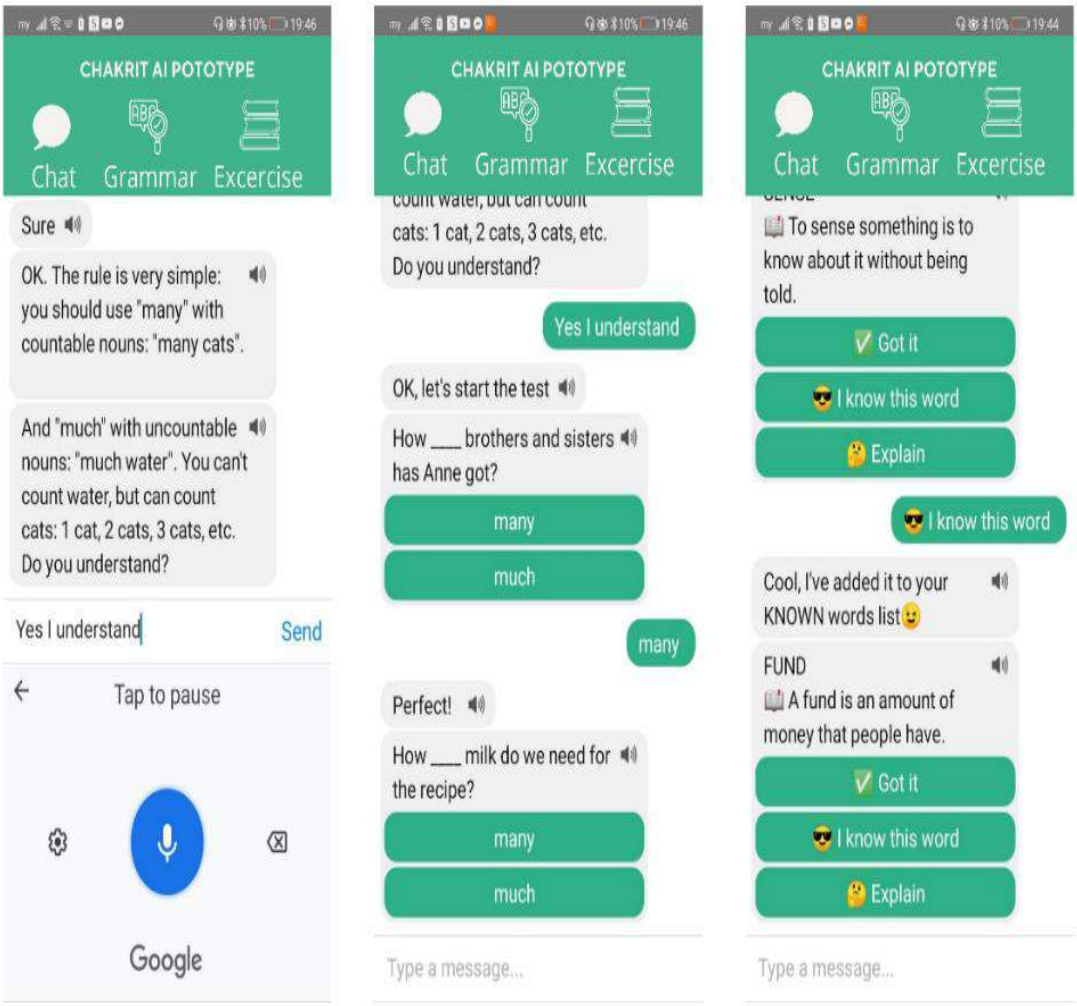
Figure 3: Development of an Algorithm System Model in Teaching English to Thai Students (2)



In the algorithm system model, students will be able to create their student profile account before starting the course. It contains the first name, last name, age, gender, and time setting in learning English.

Figure 4: The Algorithm Model System





In the development of the algorithm system model, the researcher created 40 English questions on speech accuracy, the use of vocabulary, sentence patterns and dialogues, grammar explanation, and clear pronunciation and fluency in English speaking. The model contains sentences suitable for students at the lower secondary level, content taken from the assigned course book.

When the students under study started using the model, they were able to use questions with the algorithm. The algorithm responded with correct versions when the students mispronounced words or sentences. In such a sequence of students' performance and the algorithm's responses, the students were encouraged to speak English clearly and fluently by repeating after the correct versions provided by the algorithm. The system model was classified into levels of language difficulty. In this way, teachers will need to use the system model as an assistant to help support their students to work on vocabulary, grammar, sentences, dialogues, and pronunciation practices. To the researcher, the AI technology provides a mechanism or an algorithm containing a set of instructions or step-by-step conditions on the computer that will allow learners to learn by themselves by interacting with the pseudo teacher or the algorithm a specific teaching purpose. Students simply communicate or interact with the thinking machine that has its big data to cover

what learners are expected to learn to use English in writing and speaking. The researcher designed a controlled learning by predicting results by classification of language performance-based data. Automation distinguishes and creates patterns from the received data. In this regard, the system model carries a preliminary set of commands of 40 words, for instance, in the form of questions for the algorithm to respond to the users or learners.

4.2 The Effect of the Algorithm System in Use on Thai Students

Using the developed algorithmic system model in teaching English to Thai students, the researcher used the pretest to assess speech interactions between students and the algorithm. This algorithm system model was meant to improve English learning performance of the students under study. The system can learn and predict outcomes by automatically classifying, distinguishing, and modeling from the received data. It should be noted that the system was initially programmed for an introductory set of instructions using 100 question-and-answer sets. For this particular study, the researcher used only 40 question-and-answer sets.

The results on the effect of the algorithm on the students' performance showed the following:

When considering each aspect, it was found that:

- the speech accuracy score at $\bar{x}$ = 0.900 (SD=0.810) before learning, and at $\bar{x}$=9.25 (SD=1.561) after studying, with t-value= .27.518**.
- This was followed by the second place on clear and fluent pronunciation: pre-study score at $\bar{x}$=1.900 (SD=1.236), and post-study score at $\bar{x}$=9.300 (SD=1.159), with t-value= -25.674 **.
- The third rank was on the correctness of vocabulary scores before studying at $\bar{x}$=1.550 (SD =1.467), and after studying at $\bar{x}$= 9.300 (SD=1.522), with t-value=24.391**.
- The fourth rested upon grammar points before studying at $\bar{x}$= 2.750 (SD=1.750), and after studying at $\bar{x}$= 9.275 (SD=1.320), with t-value =17.456**, respectively.

5. Discussion of Results

From the obtained findings, it can be said that after the past 20 years of the Ministry of Education in attempting to upgrade the quality of English teaching and learning, Thai students still have not achieved a good result as intended and planned in the national policy. Thai students are now facing challenges in communicating in English as a second language in their study and later on when they enter the job market. As known, Thai graduates' ability to communicate in English is still at a lower level than those of the neighboring countries. Thai educators and scholars have been trying to figure out why, and most of them tend to assume that limitation in English development could have stemmed from the use of traditional teaching methods, rather poor learners' motivation, and unfavorable attitudes toward English learning. To the researcher, adjustment in the teaching method with the use of AI in the form of language learning algorithm could make it possible to improve performance of those language learners who are willing to learn to master the language for communication. From the researcher's teaching experience, interactions could be the key

and the algorithm can be available for learning and interaction without time limit as individual learners may prefer.

In developing the algorithm system model in teaching English to Thai students, the researcher used an avatar and the system can set up an account profile for learners. Students can set time for one practice session to improve their English and select the content with vocabulary related to daily life and sentences suitable for communication. The algorithm assists with accuracy in vocabulary, grammar, pronunciation, and speaking fluency. The system can answer questions from students and show them appropriateness in language use. Repetition in practice is supported until the students get the answers or responses right. The system is divided into levels of difficulty by using a set of words from simple to complex in use. This is to facilitate gradual learning with not too much pressure; easy accessibility should be made consistent for learners (Baker & Smith, 2019).

The results of the study did not appear to yield a positive support for the developed algorithm. This could involve the monitoring method of the teacher. According to Baker & Smith (2019), AI serves as a strong motivating factor for student progress, for the reason that it enables learners to be productive and can be monitored and evaluated in accordance with the objectives of the students' progress. Therefore, the understanding of the learners' motivation in setting their goals and formulating their own learning strategies will make it possible to predict the students' future learning abilities. Some researchers argue that language teachers should focus on how to help learners use translation tools effectively. In addition, English teachers should be made aware of the possibilities and limitations in providing adequate advice to students (Cook, 2010; Tatum, 2012). Two researchers (Baker & Smith, 2019)—asserted that AI systems with natural language, creativity and knowledge sharing can replace real-life language teachers. However, the issue of teaching management has to be well designed and monitored for the planned learning outcome in the first place. As shown in this present study, the tool or the algorithm is right there but the big question lies in how to make it work for the target learners to get improvement in their language performance.

The results of the experimental use of the developed algorithm system model in teaching English to Thai students before and after its use could be promising. The posttest found that after practice, the students were able to improve to a certain extent, the four aspects in speech accuracy, grammar, sentences and dialogues, and pronunciation and fluency in speaking. The researcher also assessed the students' satisfaction with the algorithm system model and found that they were quite positive about learning with the algorithm [Personal communication, 2021]. The satisfaction result was consistent with the research finding reported by Brusilovsky & Peylo (2003). They reported that most students enjoy using chatbots and generally feel more comfortable conversing with the bot than their peers or teachers. As a result, students feel relaxed and believe that this approach could help them learn the language. To students, regular conversations with chatbots boost their language confidence in listening ability and in turn increasing interest in language learning. However, it is important to note that using a chatbot may not be effective for beginners. The problem is that most chatbots respond to simple keywords and cannot assess whether the language input is grammatically correct or practical. The algorithm can address such

limitation and can also operate in well-defined situations with predictable conversations. The algorithm can handle mistakes as well as grammatical and spelling errors for learners.

6. Suggestions

The researcher would like to suggest to language teachers for the use of the algorithm system model as follows:

6.1 The algorithm system model in teaching English to Thai students is suitable for those who want to practice English conversation on their own. It can be used on both Android and iOS mobile phones. There is an AI system to help analyze the accuracy of pronunciation and learn with fun in interacting with the system.

6.2 Students must have a smart phone or a tablet. They need to download the application, register as a member and complete the settings. Students can choose conversation at their leisure or use a set of questions prepared on the system. They can set time to study at their own learning pace. If learners want to study to take the test in the test series, it will be in conjunction with a set of 100 questions uploaded on the system. Students can use a microphone in the smart phone, which is stable enough to work well with the system itself.

6.3 It is vitally important for the teacher to give guidance to students, follow up with their progress in practice with the algorithm, and collect feedback from them. The teacher's encouragement and support can help students feel confident to move along with the learning program on the system. The teacher should make it a must to let the students know that they can still resort to the teacher for help and clarification.

7. The Author

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Beyond Size and Scale: Reflections on *Small* Performing Arts Organizations

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Abstract

In every city, there are bound to be performing arts organizations (PAOs) that are considered large/big. These organizations are more well-known and are likely to possess the resources to advertise their activities in public spaces, such as train stations and shopping malls. On the other hand, smaller PAOs are less visible to both locals and visitors. This paper adds to the lack of literature on the perceptions of small PAOs in East and Southeast Asia and specifically seeks to reflect and analyze on the determinants of 'small' PAOs in Hong Kong, Singapore, and Taiwan other than the usual consideration of size and scale. The research employed two qualitative methods. Desk research was carried out on reports and website materials produced by various stakeholders, and semi-structured interviews and dialogues were conducted with 25 performing arts practitioners. I deduced that 'smallness' of PAOs could also be perceived and determined by existing funding policies, as well as the practitioners' attitudes and personal beliefs. Thereafter, I delve further into the discussions on alternative sources of income for small PAOs, the notions of social enterprises and collectives in the performing arts context, as well as the impacts of COVID-19 pandemic on small PAOs.

Keywords*: Performing arts management, small organizations, arts funding, COVID-19 pandemic*

1. Introduction

My interest in small performing arts organizations (PAOs) is influenced by my own professional experience in establishing and running a theater company in Singapore for almost a decade in the early 2000s. My company was a small-scale non-profit experimental theater company and the works produced were mostly presented in small venues of less than 200 seats, usually over a short period of three to five days. The number of regular staff in my company never once exceeded four. Most of the staff members had to multitask. I was both the artistic director as well as the general manager of the company.

In every city, there are bound to be PAOs that are considered large or big. These organizations are more well-known and are likely to possess the resources to advertise their activities in public spaces, such as train stations and shopping malls. On the other hand, smaller PAOs are less visible to visitors and even to the locals. While size and operating budget of an organization is often the key gauge of the organization's scale, the perception of 'big' vs. 'small'

organizations varies in different contexts. Current literatures on the perceptions of small PAOs are limited and Americentric and discussions on East and Southeast Asian contexts are nonexistent.

Hence, this paper analyzes and reflects on the perceptions and determinants of 'small' PAOs in Hong Kong, Singapore, and Taiwan other than the usual consideration of size and scale. These three locales were chosen based on the following reasons. First, they are highly developed economies with clear developmental policies and structures in place for the development of the performing arts. Next, most PAOs in Hong Kong, Singapore and Taiwan are non-profit in nature and therefore, cross country/region comparisons are plausible. Last but not least, there are a number of long-standing arts and cultural management academic programs in the higher education sector of these places. This suggests a longer history of discourse around management and organizational development of arts organizations.

2. Research Methodology

This research employed two qualitative methods, which were carried out concurrently. Desk research was carried out on reports and website materials produced by various stakeholders including PAOs, artists, administrators, advocacy organizations, policymakers, news media, and academic institutions. Semi-structured interviews and dialogues were conducted with 25 performing arts practitioners, who are artists and administrators in the three chosen locales, between September 2017 and June 2021. Of the 25 practitioners, 21 of them were attached to PAOs, while the remaining 4 were freelancers and/or independent artists/producers. Having dialogues with practitioners have been proven to be fruitful in the exchange of ideas and knowledge, which lead to a more in-depth understanding of the issues and problems at hand (MacInnis & Portelli, 2002).

3. Size and Scale of Small Performing Arts Organizations

As an adjective, *small* is often defined in relation to what is considered *big* (Wierzbicka, 1996). However, organizations are not just big or small. Many countries/regions adopt the collective term--'small and medium-sized enterprises' (SMEs)--for companies that are not large/big. Yet, each country/region defines SMEs differently. For instance, SMEs in Singapore are enterprises with no more than 200 staff members and an annual turnover of below S$100 million (US$74.3 million) (Tan, 2022), whereas in Hong Kong, SMEs are determined solely by the size of the establishment, i.e., up to 100 staff members for companies in the manufacturing sector, and 50 staff members for the other sectors (Ouyang, 2020). In Taiwan, the Ministry of Economic Affairs defines SMEs as enterprises with an annual revenue of NT$100 million (US$3.6 million) or less, or with fewer than 200 regular employees for most sectors except for the construction, mining, and manufacturing sectors. In addition, the Ministry defines enterprises with less than five employees as small-scale (Ministry of Economic Affairs R.O.C., 2020).

The concept of ‘medium-sized’ complicates the already unstable dichotomy between big and small. In the case of SMEs in Singapore and Hong Kong, there is no clear demarcation on when a small organization becomes ‘medium’. Moreover, when describing organizations, the term ‘medium’ is almost never used without reference to ‘size’, i.e., ‘medium-sized organizations’, whereas ‘small organizations’ and ‘large/big organizations’ are rather commonly used terms. This suggests that size, perhaps, may not be the only determinant of ‘big’ and ‘small’ organizations.

The size of PAOs is often determined in relation to their operational and management decisions. The defined boundaries of SMEs in Hong Kong, Singapore, and Taiwan may not be the best gauge of their respective PAOs’ sizes. For instance, with the current definition of SMEs in Singapore, none of the PAOs qualifies as large organizations. I argue that the total number of regular employees should not be a main determinant when assessing the size of a PAO. Generally, PAOs hire three groups of professionals, namely artists, technical specialists, and arts administrators. Moreover, the number of regular employees varies with different types of organizations. A full-fledged orchestra usually engages a larger pool of full-time musicians, whereas a theater company may prefer to work with freelance directors and actors.

PAOs tend to hire administrators before artists and technical specialists. This is, by no means, an indication that arts administrators are more important than the others. Administrators are often tasked to prepare funding proposals and implement marketing plans for the organization. Once the funding is successful, the PAO embarks on a longer-term process toward achieving its key performance indicators (KPIs) mandated by the funding bodies. This process of securing audience numbers and regular reporting for the purpose of accountability lies in the hands of administrators. Even before the completion of a project/season, administrators have to start preparing for the next funding cycle. This perpetual cycle of funding and accountability creates the urgency to hire administrators before others. Perhaps, the number of regular arts administrators and the way they are organized within the PAO may serve as a better reference in determining the organization’s size of the organization.

Larger PAOs have more administrative staff members, demarcated by clearer roles and functions fitted into departments. These PAOs usually adopt the mechanistic organizational structures, with more established (rigid) rules and regulations, standard operating procedures, as well as communication channels (Byrnes, 2014). Small PAOs, on the other hand, tend to have fewer administrators who are working organically. They are likely to take on multiple collaborative roles, instead of being boxed up in specific functions. It is common for small PAOs to only hire one or two arts administrators, who are then tasked to take care of all aspects of management, including events administration, funding applications, marketing and communications, financial management, and artists management. In some cases, artists in small PAOs have no choice but to double up as administrators.

Small PAOs are more prone to risks and surprises, such as unexpected staff resignations, lower than expected funding, or cash flow issues, as compared to large organizations. These unexpected situations could have adverse effects on the organization’s abilities to meet target

deliverables/KPIs. The defunct three-tier funding project by the Ministry of Culture in Taiwan had required grantees to fulfill a specific number of shows within the funding cycle in order to be considered positively for future cycles. Interviewees have pointed out the focus on quantity shifts the attention away from artistic quality and development. In the case of Singapore, PAOs which fail to meet the targets may even lose the opportunity to be considered for upgrade to a major company.

4. Beyond Size and Scale: Other Determinants of 'Small' Performing Arts Organizations

4.1 'Small' based on funding policies

This section proposes that PAOs could be categorized as 'small' based on existing funding policies in their respective countries/regions. In Hong Kong, the same nine PAOs, otherwise known as the Big Nine, have been allocated direct governmental subvention since 2008 under the Major Performing Arts Groups (MPAGs) scheme. For the financial year of 2021/22, the nine companies received a combined funding of HK$403.7 million (US$51.8 million). The MPAGs scheme identifies these nine PAOs as 'major' or 'big' and all other arts organizations excluded from this scheme could parenthetically be deemed as small and medium in size.

The Hong Kong Arts Development Council (HKADC) is a statutory board established by the Home Affairs Bureau (HAB) to manage the development of the arts in Hong Kong. HKADC serves the function of grant allocation, policy and planning, advocacy, promotion and development, as well as program planning of a wide range of artforms. The hundreds of PAOs excluded from the MPAGs scheme depend on HKADC for some form of project grants, as well as 1-year, 3-year, or 5-year grants. For these arts groups, longer-term funding corresponds to enhanced stability in their operations. It is worth noting that the entire operating budget of HKADC is only less than half of what the MPAGs received, suggesting that support from the council is limited.

The 5-year grant is a recent scheme introduced in 2019 specifically for selected eminent arts organizations, with a grant of $2.2 million (US$282,000) for the first year, and thereafter decreasing 2% per year for the remaining four years. This grant scheme was aimed at encouraging 5-year grantees to enhance their competitiveness and independence through seeking alternative sources of funding. There is no clear indication that the scheme would continue after 2024, nor were there discussions that the organizations under this scheme would thereafter be upgraded to the MPAGs scheme. The grant amount of $2.2 million for the eminent PAOs is still a far cry from the annual subvention disbursed to the MPAGs, with the lowest amount at close to HK$14 million and the highest up to HK$100 million.

Similar to the MPAGs scheme in Hong Kong, several major PAOs in Taiwan are revered as flagship companies under the Taiwan Brand Project. Awardees receive a combined annual funding of NT$100 million (US$3.3 million) alongside other non-financial brand building initiatives by the Ministry of Culture. Apart from the Taiwan Brand Project, the

Ministry also managed a three-tier funding project with aims to offer some form of financial stability for PAOs. Organizations are funded annually according to their awarded tier. The first tier represents an incubation stage, supporting organizations which are still in the phase of preparedness and forming. Tier two organizations are in a development stage, indicating advancement and growth. Tier three organizations are in the excellence phase, with good track records of sound administrative and artistic delivery.

Since 2019, the three-tier funding project has been replaced by the Taiwan Top project, managed by the National Culture and Arts Foundation (NCAF) with the support of the Ministry. Under this scheme, selected PAOs are entitled to either 1-year, 2-year, or 3-year grants. The Taiwan Top project seeks to gear funded organizations toward sustainable development, while continuing to produce high quality performance works. 1-year grant awardees could apply for additional project funding, while the 2- and 3-year grants are lump sum funding covering both cost of operations and artistic productions.

While some PAOs may consider themselves mid-sized, it is challenging to determine the concept of 'medium' in the context of funding. Both Hong Kong and Taiwan have established flagship status for a selected few large/big PAOs with more substantial funding, thus rendering the remaining PAOs as small. Yet, the sense of smallness differs between PAOs. PAOs that receive project-based or shorter-term year grants may consider longer-term year grantees as larger/bigger. This further reiterates the notion that 'small' is always defined in relation to what is considered 'large/big' (and vice versa).

The funding policies for PAOs in Singapore offer new perspectives to the discourse of big vs. small. As of 2021, the small city-state has 48 arts organizations funded under National Arts Council's (NAC) Major Company Scheme, of which 41 organizations curate performing arts-related activities. This number is a stark contrast compared to the MGAGs scheme in Hong Kong and the Taiwan Brand Project, where only a few privileged organizations were selected. Organizations funded under the Major Company Scheme are allocated 3-year funding covering up to 50% of expenses for organizations focusing on artmaking, 60% for community bridging arts organizations, and 70% for organizations that advocate and develop the arts sector.

Unlike the flagship schemes in Hong Kong and Taiwan, NAC presents a pathway for all PAOs to move toward becoming a major company. Emerging PAOs could first apply for the Seed Grant, which covers a maximum of 70% of the organizations' expenditure (capped at S$150,000 or US$111,600 per annum) for up to three years. The three-year duration serves as a trial period for the organization to be evaluated on its visions, commitments and drive before NAC decides if the PAO could be elevated to the status of 'major company'. In 2021, NAC placed the Seed Grant under review and PAOs no longer need to go through this probation period in order to apply for the Major Company Scheme.

Funding policies in all three locations studied have gone through some form of major review/revamp. The MGAGs scheme in Hong Kong was only introduced in 2007. The funding policies for major companies in Singapore also evolved from a privileged circle for a few to include a larger pool of PAOs. The introduction of new funding schemes is sometimes

influenced by existing initiatives of the PAOs themselves. For instance, Act 3 International, or Act 3 (prior to 1994), had produced drama education programs in Singapore even before the formal establishment of NAC. To a certain extent, the company's efforts in art education influenced the inception of NAC's Arts Education Program (AEP) in 1993, which supports schools in their art education plans. Political situations could also trigger funding policy changes. In Taiwan, for instance, some practitioners are concerned that good policies might be short-lived due to possible political changes at both local and federal levels every few years. It is surmised to say that the notion of 'small' PAOs evolves when there are shifts in funding policies.

4.2 'Small' as an attitude

In this section, I argue that 'small' is sometimes an outcome of the practitioners' attitudes and personal beliefs. From a management perspective, there is no doubt that organizations seek to grow and develop. Nevertheless, some PAOs have no intentions of ever growing in size and scale. Several small PAOs expressed disapproval to the bureaucracies brought about by government funding and they relate larger PAOs to increased accountability to stakeholders, who may not have anything to do with the arts. A couple of practitioners have revealed to me that the sole purpose for registering their PAOs as non-profit organizations was to gain access to government funding and subsidized rental rates of performing arts venues.

Many small PAOs present cutting-edge avant-garde works. Some of these works respond to socio-political issues that are considered non-mainstream, such as issues faced by LGBTQIA+ and other subordinated/marginalized communities. I spoke to a founder of a Taipei-based PAO, which considers themselves advocates of feminist issues. To them, every theater work they put up represents a message/voice the artists believe, which the public ought to be aware of. In these works, there is a strong emphasis on intimacy with audience. Furthermore, larger PAOs are more likely to face artistic interference from myriad stakeholders. Thus, remaining small is crucial to ensuring intimacy and preserving artistic freedoms.

'Small' could sometimes be deemed as lower in importance, especially when referring to an issue or challenge (for example: *Don't worry, it's a small problem!*). Small organizations may be viewed as less important than the larger ones in terms of contributions and repute. The term 'small' in 'start small' and 'think small' alludes to ambitions. For this reason, Small PAOs could also fall into the trap of small-mindedness. Many of these PAOs do not have clear strategic plans with defined goals, objectives, and action plans. Time and resources are needed to ensure that strategic plans are carefully crafted with the purpose of fulfilling the organization's longer-term mission, vision, and values.

Some practitioners have responded that they do not have the luxury of time as they often move from projects to projects due to limited funding. Small PAOs may not see the need to form a board, and even when they do, the board is usually a convenient composition comprising the peers of the founder and/or key appointment holders. Strategic planning, compliance, and/or fundraising are usually not the key focus of small PAOs' boards. From my

observations, however, small PAOs that developed strategic plans with the support of an effective board are more likely to move up the grants ladder within a shorter time span.

For an organization, starting/thinking small does not mean a lack of will to succeed, but rather, it suggests a planned, step-by-step approach towards achieving its goals. On an even more empowering note, the phrase 'good things come in small packages' implies that organizations do not need to be large/big to be considered good. Indeed, small organizations are known to contribute to the local economy (Brown, 2018), generate meaningful employment, and provide opportunities to develop one's capabilities in different aspects of the field (Bideaua, 2021).

5. Discussions

5.1 Alternative sources of income

One of the main takeaways of this research is in how small PAOs embodied their 'smallness' in relation to funding. The divide is especially obvious between PAOs in Hong Kong and Taiwan. In Hong Kong, practitioners from small PAOs are more likely to victimize themselves when expressing their views on funding. They tend to expect funding from the government and lament on their lack of funding and/or the overfunding of other organizations. In contrast, PAOs in Taiwan seem to agree that government funding, if any, serves to support their cause only partially. Some practitioners in Taiwan are even willing to have their funding reduced if the government could invest more in audience education as well as making the arts accessible to the general public.

The bulk of governmental funding tends to go to large PAOs, and in the case of Hong Kong, government subvention could cover up to 80% of the annual expenditure of a Big Nine group. Small PAOs face challenges in raising funds to cover their expenses. They are less likely to depend on ticket income due to small-scale/shorter-run performances/activities. This also means that small PAOs are less attractive to corporate sponsors who are mostly looking at reach. In 2016, I convened a conference to discuss the funding disparity between major and small/medium PAOs in Hong Kong. One of the conclusions from the conference was for smaller arts organizations to rethink their strategies to be less dependent on governmental funding.

One way in which small PAOs have generated additional income was through customizing performances for corporate functions. Interviewees have expressed hesitations for commercial activities as they perceived such productions as going against their artistic integrity. PAOs that had ventured into commercial offerings moved out of this space quickly once they secured other forms of stable income. Yet a PAO in Taiwan has been successful in retaining their artistic vision into their performances for corporate events. Due to their unique offerings and high-quality performances, the PAO has garnered many invitations and commissions by corporations and governmental agencies.

Seeking corporate sponsorships is always an uphill task for all PAOs, let alone small organizations. Nevertheless, there are success stories of small PAOs securing corporate

sponsorships as well as non-arts funding through cause-related projects. These projects often seek to alleviate societal issues or involve active participation of underserved communities using arts as a platform/agent of change. For instance, a music group in Singapore I visited has received funding from a non-arts' governmental agency for a racial integration music project.

Many small PAOs in Hong Kong, Singapore, and Taiwan have expanded into the field of arts education, such as performance showcases and training workshops, conducted in schools and/or their own premises. Schools often put aside a budget for arts education programs and would often invite arts organizations and artists to develop these activities. Apart from generating additional revenue for PAOs, arts education programs could contribute to visibility and reputation of the organizations through exposing them and the artists to young audiences, who may become regular audiences in the future. Yet, arts education is not a new concept. NAC's AEP was introduced almost 30 years ago in 1993. Compared to the 1990s and 2000s, the arts education space today has become more competitive and PAOs are expected to be creative in their offerings. Instead of selling pre-designed programs, PAOs are customizing programs according to the demands of schools.

5.2 Other types of small performing arts organizations

Up to this point, I have been reflecting on small non-profit PAOs, which are in the majority in Hong Kong, Singapore, and Taiwan. In this section, two other types of PAOs, namely social enterprises and collectives, are introduced.

There is a growing trend of PAOs registering as social enterprises, especially in Singapore. A social enterprise offers solutions to societal problems, and pushes for change (Bornstein & Davis, 2010). Such an enterprise differs from traditional corporations that focuses on the bottom-line, i.e., maximizing profits (Roug, 2018). Nevertheless, social entrepreneurs need to have good business acumen so that the changes they effect could be sustainable in the long run (Munoz, 2010). Yet, to tackle a social mission is not just limited to social enterprises. Many big corporations have embedded social causes into their operations beyond just philanthropy, but also actively instituting changes and reshaping ecologies through their product offerings. Non-profit organizations these days are also becoming more entrepreneurial (Lane, 2015). When government funding is limited, non-profit organizations need to seek creative ways to survive.

The idea of being part of a formally registered organization offers practitioners a stable place to foster the sense of belonging, like that of a family nucleus. Nevertheless, collectives are gaining prominence, especially amongst freelancers and independent artists/producers. An art collective is a group of practitioners working together on a project towards a common goal (Clyde, 2016). A noteworthy similarity between a small PAO and a collective is the trend of multitasking. Similar to practitioners working in small PAOs, the members of an art collective have to carry out artistic, administrative, and technical work with limited manpower and financial resources. Moreover, arts collectives also seek for different sources of income in order to sustain and fund their activities (Brown, 2015). There is a major difference between

PAOs and collectives though. Members in a collective share ideas, costs, and resources of the project, whereas small PAOs could be more hierarchical with one key decision maker. At times, collectives may include members from different geographical locations, which open opportunities for a project to premiere in different countries/regions and receive support from multiple funding sources.

5.3 Being 'small' in the face of COVID-19

My initial intention was to complete this research within two years. As a matter of fact, the first draft of this paper was completed in April 2020, just weeks after the World Health Organization declared the coronavirus as a global pandemic. Then, I felt that the paper would be incomplete if there are no reflections on the issues faced by small PAOs during the pandemic. This research was therefore extended for another 14 months and triggered two new research projects on the performing arts during the pandemic.

Without a doubt, the performing arts, as an art form that emphasizes on live experience and presence, faced existential challenges during the pandemic. The closure of performing arts venues led to waves of cancellations and postponements of performances. The entire performing arts industry was badly hit but the impact was felt more by small PAOs and independent artists/producers. Some practitioners were forced out of jobs and had to switch careers. Stepping away, however, is not a sign of giving up, but a privilege accorded to small PAOs. Practitioners could take the time to reflect on their practice and eventually return with more cutting-edge creative projects. Large PAOs, on the other hand, are expected to strictly adhere to the key deliverables and even in the face of the pandemic, they continue to churn out one project after another.

Many small PAOs and independent artists have also continued to create and launch new works on online platforms with minimal investments and training in technologies. Some of these works broke geographical boundaries and included performers from different countries/regions. Collectively, these new works pave the way toward the era of performing arts and digitization. From my conversations with practitioners, I noticed distinct differences in the perceptions toward the use of digital platforms. Majority of the practitioners from big and small organizations in Hong Kong tend to consider digitization as a stopgap measure during the pandemic. Rightly so, the performing arts is meant to be experienced live by audiences sharing the same space with performers and the experience can never be replaced by online platforms mediated by screens.

Nevertheless, in the spirit of 'smallness', PAOs should not undermine the potential of the cyberspace in enabling experimentations and new creative practices. Singapore's NAC rolled out the 'Digitalisation Presentation Grant for the Arts' (DPG) shortly after the outbreak of COVID-19. The scheme supported artists and arts organizations to present their work in digital form or via digital format during the COVID-19 pandemic. In less than six months, the scheme supported over 500 projects and created 7000 work opportunities. DPG has since been

incorporated into the NAC's regular funding scheme, which is a clear indication that arts and digitalization is now part of mainstream creative practice in Singapore.

6. Conclusion

Through this multi-year research, I deduced that, apart from the organizations' size and scale, 'smallness' of PAOs could be perceived and determined by existing funding policies, as well as the practitioners' attitudes and personal beliefs. Small PAOs exude qualities of creativity, entrepreneurship, multitasking, and resilience, often under precarious conditions. A single small PAO may be deemed as insignificant in its contribution to the performing arts ecology, but collectively, they make up the strong backbone of a country/region's cultural and creative industries and at the same time, contribute to artistic diversity and practitioners' resilience. In conclusion, I hope this paper contributes to the lack of inter-Asia discourse on small arts organizations and inspire more arts management scholars and students to focus on the values of smaller PAOs.

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Sharing Professional Viewpoint:
Future Vision of Digital Marketing for Metaverse

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1. Introduction

In the past, the industrial revolution brought about change in technology for mass production. At present, the pandemic Covid-19 has caused even more rapid change in technological disruption of the new world of technology. As technology advances, human behaviors tend to lag behind because people in general once accustomed to their mundane pattern of life are not willing to step outside their comfort zone. Despite their unwillingness, the Covid-19 pandemic has quickly prompted a crucial link between the physical world and the virtual one of the Metaverse. This is an important point that makes various business brands turn to shift their marketing strategy to the full online platform for the organization to survive. Consumers are also trying to adjust themselves to use marketing services through the online channels. These include all kinds of services, ranging from food ordering online to all other business activities and operations to survive through challenges of fierce competition.

2. Future Vision of Digital Marketing for Metaverse

As known, the life cycle of a product varies to respond to consumers' needs. Entering another world online like Metaverse which blends the real environment into the virtual space, consumers seen as avatars can do activities in the virtual world as they may prefer. When online with VR (Virtual Reality) and AR (Augmented Reality) technology, consumers can talk to people around the world without spatial borders or time limits. Time in the Metaverse features the same as in the real world. From a marketing point of view, it is a completely new business opportunity that has gone beyond the physical world. Business owners are able to invest in trading business in digital assets known as blockchains; payment of goods can be done through a digital currency called Bitcoin or cryptocurrency. Willing or not, Thailand and many other countries, sooner or later, need to accept cryptocurrencies for trade in the virtual world. As a business entrepreneur, everyone can create digital contents to do business and design various activities with creativity. The possibilities of Metaverse Marketing lie in a great opportunity for business owners to contact and offer products to consumers directly, without having to go through an intermediary and they can do media advertising at a high speed to reach target customers. The business operators can build a brand image for their products with service information, shared news, and product knowledge on a large scale. Since Metaverse uses blockchain technology to make data transparent and neutral available to people who are interested. A good opportunity to generate new income is obvious, like income from creating advertising media, building a company building or a storefront, expanding business, and earning from extended agencies.

When it comes to consulting, negotiating and doing business on Metaverse, entrepreneurs can buy or rent 'land' in the Metaverse. In this regard, planning for Metaverse marketing strategies has become a challenge for community members of the virtual world to

invest in developing their strategies, whether it could be for Sandbox, Decentral and Meta (formerly Facebook). Currently, those businesses that have stepped into the Metaverse are NIKE, partnered with Roblox to create NIKELAND, Microsoft enabling Microsoft Azure developers to create a digital world that parallels with the real-time world, and virtual environments to be replicated. Google has recently launched Project Starline to make meetings virtual. This is in line with research from ARK Invest, an active ETF asset management firm, that by 2025 the global gaming market will have a revenue up to 16% while the AR & VR market will grow 59% from 2020 (ARK Investment Management LLC, 2020).

Kim (2021) stated that the common attributes of the Metaverse appear to be the continuity (or persistence) of identity and objects, a shared environment, the use of avatars (or embodied selves), synchronization, being three-dimensional or virtual, interoperability, and a user experience that is interactive, immersive, and social. The Metaverse serves as an interoperated persistent network of shared virtual environments where people can interact synchronously through their avatars with other agents and objects. This is a broad and evolving definition which can shift as the Metaverse continues to be built and used, for the Metaverse is constantly evolving with service providers and other businesses to expand their marketing channels. Of course, a career that will support these things falls on those who can create 3D Virtual World technology through Mobile & Web Platform, Digital & Virtual Commerce, Chatbot, and Interactive & Retail Innovation. In line with Wunderman Thompson, there are key elements that characterize the Metaverse in that such a virtual world has no end. In this scenario, the future vision of digital marketing for Metaverse will rest upon real-time responses to business actions in the virtual world with data stored on the Blockchain that no one owns. It is an important system that makes information transparent and neutral in a space that allows people or ‘creators’ to interact with others via their contents. These people in their avatar integrate the real world with the limitless virtual sphere via AR technology.

3. Recommendations

It is possible that the Metaverse could support the interpersonal and family relationships. Since such relationships in the real world tend to weaken in the course of time, the Metaverse could have a great potential in restoring positive relations among people. Another point of concern from the author is about marketing ethics in marketing activities in the Metaverse. Business people and consumers need to be well aware and well prepared for possible shortcomings and negative effects of the virtual world on their lives, and learn to keep a good balance in ‘existence’ between the two worlds for their physical and mental well-being.

4. The Author

The author Cattleya Rerkpichai, D.I.Ed., is a full-time lecturer in the Business Administration Program, the Faculty of Creative Digital Marketing at Bansomdet Chaopraya Rajabhat University (BSRU), Bangkok, Thailand. Her research interest is in the areas of Product Innovations and Digital Marketing.

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