Causal Relationship Model of Artificial Intelligence on Marketing Mix and Preparedness of Small and Medium Enterprises in Bangkok Metropolitan Area

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Abstract

The objective of this research was to understand the influence of technological, organizational and environmental (TOE) contexts in the adoption of AI in SMEs located in the Bangkok Metropolitan Area, where maximum businesses are concentrated. For this, the data was collected from 320 respondents employed in different SMEs. To facilitate this study, a structure with several variables, namely dependent (preparedness of SME), independent (technological, organizational and environmental) and mediating variable (marketing mix) was developed. PLS-SEM (Partial Least Squares Structural Equation Modeling) was utilized to explain the proposed hypothesis.

It was revealed that the technological, organizational and environmental contexts were important in terms of adoption at leadership and individual level and overall openness to embrace technologies were effective in the adoption of AI in SMEs. Further, the mediating role of marketing mix indicates that use of AI-tools in the marketing strategy will support the adoption of AI. The study implies that the probability of adoption of AI in SMEs will be benefitted by a positive attitude towards the technology adoption, at organizational, individual, and leadership level adoption and system openness. The study has practical implications; it can be posited that Thai SMEs can effectively use AI to grow and operate multitude of activities in a smooth fashion in the competitive scenario where large and international firms have already started harnessing the benefits of AI. Additionally, in the current Covid-19 pandemic scenario, AI tools can allow remote access to services.

Furthermore, the performance level of SME in the post adoption stage also needs exploration through future research works.

Keywords: Artificial Intelligence; Marketing Mix; Bangkok Metropolitan Area; Thailand

Introduction

Technological innovations have been the fundamental drivers of economic development for more than two centuries. The most significant of these are what is termed by economists as "general-purpose technologies," for instance, the steam engine, internal combustion engine, and electricity, each of which facilitated matching inventions and prospects. In the present day, the most significant "general-purpose" technology is artificial intelligence (AI). In the business sphere, AI is in a position to have a transformational effect similar to the previous general-purpose technologies. While it is in use in several organisations globally, its potential has not yet been fully realised. The impact of AI is anticipated to be seen in different industries, including manufacturing, transportation, retailing, healthcare, finance, advertising, entertainment, insurance, law, and education, as they alter their fundamental systems and business models to make the most of the different aspects of AI such as, machine learning (Brynjolfsson & Mcafee, 2017).

Small and Medium sized Enterprises (SMEs) are one of the important and significant sectors for economic development with the usage of technological based equipment and systems for their business operations. The significant role of SMEs cannot be underestimated, and they must consider as the core of business and economic development in the country (Taiwo, Ayodeji, & Yusuf, 2012). The phenomenon of SMEs have been explained in-depth but there is dire need to investigate the usage of technology and Artificial intelligence to perform business activities (Muriithi, 2017). The role of technology is evident and current business environment has become more complicated and intense due to utilization of emerging technological use to conduct business operation to gain various benefits. The employees must be capable of understanding latest technology-based applications and enhance their skills for the usage of AI at workplace for managing business activities including marketing, finance, management and production. The purpose of current study is to deeply examine the role and influence of AI on marketing strategies of firms in Thailand. So the power of AI also lies in its capabilities to perform operations on the data provided in wide range of formats (Corea, 2019; Kamishima, Gremmen, & Akizawa, 2018).

Further, a news article in the Bangkok Post (Leesa-Nguansuk, 2019) predicted that there will be an increase in technology use in businesses in Thailand due to "powerful machine learning, predictive ability, and automation." Moreover, the president of the Thai Tech Start-up Association predicted that "the challenge for Thailand will be that most workers are low- or mid-level employees, meaning that many of the jobs for Thai employees will be replaced by automation, especially in the sectors of healthcare, banking, and retail." Thus, it is likely that AI will severely impact both employment and society in Thailand. Nevertheless, it also offers a positive impact on society, in general, and opportunities to boost high-level sophisticated jobs (Schmitt & Orlov, 2019). It could be seen that adoption and implementation of AI is a desirable option for organizations to get an advantage over their competitors and to remain sustainable in the market.

Considering this scenario, it becomes crucial to comprehend the elements that govern the adoption of AI within SMEs in Thailand. It could also be seen from Thailand 4.0, that a considerable focus is required on the use of technology to develop economic success in the country. This, coupled with the potential of the service sector to incorporate technology while continuing to create jobs, indicated that a scrutiny of the preparedness of firms in the service sector to adopt technology, in general, and AI, in particular, was necessitated.

Research objectives

To examine the influence of technological context, organizational context, environmental context and marketing mix on the preparedness of Thai SMEs for the adoption of AI.

hypotheses

1. Technological, Organisational, and Environmental contexts have a significant influence on the preparedness of SMEs for the adoption of AI.

2. Marketing mix has a significant influence on the preparedness of SMEs for the adoption of AI.

3. Marketing mix mediates the relationship between technological context and the preparedness of SMEs for the adoption of AI

4. Marketing mix mediates the relationship between organizational context and the preparedness of SMEs for the adoption of AI.

5. Marketing mix mediates the relationship between environmental context and the preparedness of SMEs for the adoption of AI.

Literature Review

Concepts and theory related to AI and marketing mix

The origins of the term "artificial intelligence" can be traced to the initial years of the 1940s when the author Isaac Asimov used it as his premise in the short story Runaround. However, it was not used formally until Marvin Minsky and John McCarthy utilised it in a conference in 1956 (Haenlein & Kaplan, 2019).

Another viewpoint of AI has been provided by Davenport and Ronanki (2018) who describe it as a kind of technology that can support three significant needs of business: "automating business processes, gaining insight through data analysis, and engaging with customers and employees" (p. 4). AI has also been described as the capacity of a system to "correctly interpret external data correctly, to learn from such data, and to use those learnings to achieve specific goals and tasks through flexible adaptation" (Haenlein & Kaplan, 2019, p. 15). In simpler terms, AI is a computer program that, to different extents, has the capability to gain knowledge from data and independently make decisions.

Categorisations of AI

Davenport and Ronanki (2018) categorised AI based on business capabilities: process automation, cognitive insight, and cognitive engagement. Process automation pertains to automation of tasks, both physical and digital. This is usually related to financial and back-office clerical activities. Cognitive insight, on the other hand, indicates detection of patterns by using algorithms from huge amounts of data, followed by interpretation of their implication. Lastly, cognitive engagement denotes projects where customers and employees are engaged through the usage of intelligent agents, chatbots, and machine learning (Davenport & Ronanki, 2018).

Artificial intelligence in business

As discussed earlier, AI has been categorised based on its business capabilities (Davenport & Ronanki, 2018) which leads us to understand that the role of AI in business can be significant. Accordingly, the use of AI in business is discussed in various studies. For instance, Ivanov and Webster (2017) scrutinised the costs and benefits of AI adoption by travel, tourism, and hospitality (TTH) firms. They highlight that such firms have commenced the adoption of "robots, artificial intelligence and service automation (RAISA)" in different forms such as,

delivery robots, chatbots, conveyor restaurants, robot-concierge, self-service information kiosks, self-service kiosks for check-in/-out, to name a few.

Concepts and theory of technological context

Swanson (1994) suggested that innovation in information systems can be grouped into three definite kinds. That is, innovations that take place: "1) within the information systems function (Type I), 2) at the individual user or work group level (Type II), and 3) at the organizational level (Type III)" (Hsiao, 2018, p. 132). Drawing upon Swanson (1994), three forms of IT innovation were identified by Lyytinen and Rose (2003): "1) changes in the base technology as defined by functionality, speed, reliability, architectural principle, or other features, 2) changes in IS development as defined by modelling and design principles or by coordination of related processes, and 3) changes in services as defined by changes in general service features" (Hsiao, 2018, p. 132).

Concepts and theory of preparedness of SMEs

The adoption of artificial intelligence applications and technologies in small and medium enterprises in Thailand appears to be at a nascent stage. Consequently, the attention is directed mostly towards the adoption of technologies by individuals as could be seen in the studies of Kijsanayotin & colleagues (2009); Phonthanukitithaworn & colleagues (2015); Puriwat & Tripopsakul (2017); and Saengchaia & colleagues (2019).

Business-models based on AI

Value creation and enhancing business advantage has been stimulated by diverse industries through AI such as, consumer products, technology/media, health care, energy, financial sector, public sector, etc. (BCG, 2018). A value-based business enhancement denotes a network of inter-reliant business undertakings whereas innovation in the value-based business enhancement denotes a considerable alteration in the functions and value creation of a firm, commonly resulting in enhanced firm performance (Gassmann, Frankenberger, & Sauer, 2017). Ng (2018) provided a five-step playbook on how to lead an organisation into the age of AI. The five steps are as follows:

Research Methodology

Population and Sampling: The population of the study is SMEs in Thailand having over 3 million firms according to the Office of Small and Medium Enterprises. The stratified random sampling technique to be utilized of different SMEs prior to simple random sampling for the final selection as SMEs using latest AI based technologies as the most potential

respondents for this study. According to Siddiqui, Bajwa, Elahi, & Fahim (2016) the sample size would be determined as 20 times the number of questions of constructs. The total number of constructs of this study is placed at 15; therefore, the total sample size would be determined as 300 (or 15 x 20).

Research instrument: Major Instrument being used for collecting data in quantitative research is a questionnaire composed of 3 parts as shown below

Part I is composed of personal data of the respondents: 1. Age 2. Sex 3. Education level 4. Role in the organization 5. Company sales turnover

Part II is composed of opinion on Causal Relationship Model of Artificial Intelligence on Marketing Mix Preparedness of Small and Medium Enterprises in Bangkok Metropolitan Area pertaining to the following contexts: 1. Technological context 2. Organizational context 3. Environmental context 4. Major Marketing mix 5. Readiness of SMEs. By using opinion levels of 5-point Likert Scale.

Part III is composed of Open-End Questions for their opinion and suggestion about Causal Relationship Model of Artificial Intelligence on Marketing Mix Preparedness of Small and Medium Enterprises in Bangkok Metropolitan Area

Data collection: Primary data sources are quantitative and qualitative. The quantitative data sources are survey questionnaires and interview questions and the qualitative sources are field observation, interviews, and informal discussions

This study was also conducted with a qualitative approach and conducting online surveys. The advantage of using online surveys as a method is that it allows respondents to raise issues that the researcher may not have expected. All surveys with employees, management, and technicians were conducted by the corresponding researcher via the Google Forms due to prevailing COVID-19 situation

Data analysis

Quantitative data analysis: Quantitative data is obtained from primary data discussed above in this chapter. This data analysis is based on the data type using Excel, SPSS 20.0, Office Word format, and other tools. This data analysis focuses on numerical/quantitative data analysis. Under the data analysis, exploration of data is made with descriptive statistics and graphical analysis. The analysis includes exploring the relationship between variables and comparing groups how they affect each other. This is done using cross tabulation/chi square, correlation, and factor analysis and using nonparametric statistic and partial least squares structural equation modelling (PLS-SEM).

Qualitative data analysis: Qualitative data analysis is used for triangulation of the quantitative data. The interview, observation, and report records are used to support the findings. The analysis is incorporated with the quantitative discussion results in the data analysis parts.

Reliability of data: The reliability of measurements specifies the amount to which it is without bias (error free) and hence ensures consistent measurement across time and across the various items in the instrument. In reliability analysis, it will be checked for the stability and consistency of the data. In the case of reliability analysis, the researcher will check the accuracy and precision of the procedure of measurement. The measurement shall fulfill the requirements of reliability when it produces consistent results during data analysis procedure.

Results

The association of Preparedness of the SMEs with Technological context, Organizational context, Environmental context and Marketing Mix were analyzed using Pearson's correlation coefficient, which is a measure of the strength of linear association between two variables. The results provided in Table 4.23 show that Preparedness of the SMEs is positively and significantly associated with Technological context ($r = 0.745$; $p < 0.01$), Organizational context ($r = 0.789$; $p < 0.01$), Environmental context ($r = 0.658$; $p < 0.01$) and Major Marketing Mix ($r = 0.835$; $p < 0.01$). Technological context was found to be strongly associated with Organizational context and Major Marketing Mix, while moderately associated with Environmental context ($r = 0.800, 0.805, 0.722$; $p < 0.01$). Organizational context was found to be moderately associated with Environmental context and strongly associated with Major Marketing Mix ($r = 0.721, 0.802$; $p < 0.01$), which, in turn, were found to be moderately associated with each other ($r = 0.746$; $p < 0.01$).

Table 1 Show correlation between the study variables

S.N.	Variables	Mean $\overline{X}$	SD.	1	2	3	4	5
1	Preparedness of the SMEs	4.02	1.01	1				
2	Technological Context	3.98	1.05	0.745**	1			
3	Organizational Context	3.95	1.08	0.789**	0.800**	1		
4	Environmental Context	3.59	0.88	0.658**	0.722**	0.721**	1	
5	Major Marketing Mix	3.92	1.10	0.835**	0.805**	0.802**	0.746**	1

Hypothesis testing

Linear regression analysis was applied to study the impact of Technological context, Organizational context, Environmental context and Marketing mix on the Preparedness of the SMEs. Accordingly, the following hypothesis was stated to be tested
There is a significant impact of Technological context, Organizational context, Environmental context and Marketing mix on Preparedness of the SMEs.

The analysis has been presented in Table 2, 3 and 4. Table 2 shows that the respondents agreed to the impact of Technological context (M = 3.98 ± 1.05), Organizational context (M = 3.95 ± 1.08), Environmental context (M = 3.59 ± 0.88) and Major Marketing Mix (M = 3.92 ± 1.10) on preparedness of the SMEs (M = 4.02 ± 1.01). The regression analysis showed that 73.9% of the variation in preparedness of the SMEs could be explained by technological context, organizational context, environmental context and marketing mix (Table 3). Moreover, the regression analysis showed a significant and positive correlation among technological context, organizational context, environmental context, marketing mix and preparedness of the SMEs with $F_{(4, 315)} = 223.317$, $p < 0.01$.

As depicted in Table 4, the regression constant value was 0.736. The regression coefficient values indicated that every unit change in Organizational context and Marketing Mix of the organizations undergoes 0.287 and 0.5 units of change ($p < 0.001$), respectively, in preparedness of the SMEs. Thus, H1A which states that there is a significant impact of Technological context, Organizational context, Environmental context and Marketing mix on Preparedness of the SMEs is partially accepted.

Table 2 Show descriptive for the impact on Preparedness of the SMEs

Constructs	Mean ($\bar{X}$)	SD.
Preparedness of the SMEs	4.02	1.01
Technological Context	3.98	1.05
Organizational Context	3.95	1.08
Environmental Context	3.59	0.88
Major Marketing Mix	3.92	1.10

Table 3 Show model summary for the impact on Preparedness of the SMEs

R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
				R Square Change	F Change	df1	df2	Sig. F Change
0.86	0.739	0.736	0.517	0.739	223.317	4	315	0.000

Table 4 Show coefficients for the impact on Preparedness of the SMEs

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	0.736	0.127		5.806	0
Technological Context	0.077	0.053	0.08	1.458	0.146
Organizational Context	0.287	0.051	0.308	5.643	0.000
Environmental Context	-0.031	0.053	-0.028	-0.594	0.553
Major Marketing Mix	0.5	0.052	0.544	9.62	0.000

Discussion

Given the fact that AI implementation and adoption in SMEs is at its nascent stage, a limited literature is found on AI adoption in SME. The adoption of technological innovations including AI is progressing in SME as well as in other sectors such as manufacturing sector, health sector, food sector, etc. Additionally, large and international firms such as Twitter, Facebook and so forth have already started harnessing the benefits of AI. The application of Big Data Analytics is highly used by IT organizations. AI and Big data are interdependent entities. So based on studies on technological adoption in different firms, the findings on factors affecting technological adoption intention can be extrapolated to AI adoption in SMEs. In that context, Lai et al. (2018) noted that in supply chain management of IT organizations, adoption of BDA in daily operations depends on perceived benefits and the support received from top management. Besides, environmental factors like government policy, connectivity and competitive pressure have a moderating effect on adoption intention. The paper clearly implicates top manager persuasive nature in the development of strategies for technology adoption. Kitsios and Kamariotou (2021) analyzed nearly 81 articles to create a theoretical model to overcome challenges faced in the practical implementation of AI. From the findings

it was assimilated that the alignment of IT strategies like AI, ML, Deep Learning, Big Data and digital technologies with business strategy on decision support, processes and services, development of new product and organizational capabilities will enhance the value and performance of firm and increase their sustainability. According to authors, for the AI value creation four concepts are required AI and Machine Learning in organizations; alignment of AI tools and Information Technology (IT) with organizational strategy; AI, knowledge management and decision-making process; and AI, service innovation and value. A similar correlation can be drawn between the use of AI in SMEs.

Suggestion

Suggestion for the policy and practical recommendation

1. In the current scenario, where multiple other small industries and large industries are popping up, a competitive edge is necessitated for the sustenance of SMEs. Additionally, quick adjustment to changing market conditions and consumer demands, and innovativeness in marketing is required. Taking cue from large organizations, AI tools have the potential to transform the environment and practices within the organization and alter the marketing variables.

2. The incorporation of AI tools in SMEs can help to create new business models, scale-up the business, and enhance productivity as well as accessibility. Thailand's SMEs provide a greater contribution towards GDP of the country. The relation of SME output and capita income is essential to maintain the contribution towards a country's GDP.

3. According to a survey from 76 provinces, total factor productivity and comparative advantages were revealed as the two important factors in contribution of the SMEs to Thailand's GDP. SMEs in wholesale and retail trade, tourism and travel-related activities, transportation, and construction all play major roles in contributing to Thailand's economic growth.

4. The government should continue to promote these services with unambiguous policies suitable for each region and province. Educational services also require more attention from pertinent agencies. From this study guidelines can be drawn from the present study and extend to studies related to the adoption of upcoming technology in different industries.

5. For the practitioners and decision-makers of Thai SMEs the present study will aid in evaluation of different parameters under technological, environmental and organizational context and to draw guidelines for the adoption of AI.

Suggestions for the future research

1. There is a need to improve the existing policies to support digital transformation in small and medium enterprises. For future research, government policies on AI implementation in SMEs may be required.

2. The data on technology adoption and AI adoption in SMEs from other provinces of Thailand should be collected and evaluated. It is recommended to obtain secondary data from the Thai government on the AI adoption in SMEs.

3. In this study, the response was collected from the owners and employees of SMEs. To enhance the insight into AI adoption, the perception of AI vendors on the acceptance of technology by SMEs should also be explored.

4. A qualitative analysis accompanying employees at different levels of organization and from different industries should be performed. This will give an insight to the level of integration of AI within particular sector of SMEs and will also highlight on the challenges faced by individual SME in terms of adoption of AI. Additionally, the indicated pros of AI adoption can be extended to application of AI in other SMEs.

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