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Preface

This e-book describes the research papers presented at the International Conference on Emerging Computational Technologies (ICECoT 2021), organised by Faculty of Computer and Mathematical Sciences (FSKM), UiTM Cawangan Melaka. The main discussions of the conference is on the technological advances that help shape the skills that are required to cope with the Fourth Industrial Revolution (IR 4.0). Considering that this is our first attempt at organising a conference, we are therefore greatly honoured that the Universitas Negeri Semarang (UNNES), Indonesia, Mahasarakham University (MSU), Thailand and University of Hail (UoH), Saudi Arabia have all agreed to become our partners by contributing several reseach papers as well as providing reviewers to assess the quality of the papers.

Out of the numerous research works that had been submitted and reviewed, the Editorial Board have selected 22 papers to be published in the e-book. The discussions of these papers pertain to the use of technologies within the broad spectrum of Computer Science, Computer Networking, Multimedia, Information Systems Engineering, Mathematical Sciences and Educational Technology. It is hoped that the research findings that are shared in this e-book can benefit those who are interested in the various areas of computational technologies; such as graduate students, researchers, academicians and the industrial players, to name a few.

As the Project Manager, I would like to thank all of the committee members from the bottom of my heart for their tireless efforts in ensuring the success of ICECoT 2021. Without their continual support and excellent teamwork, this conference would not have come to fruition. In fact, holding this major event has been a good learning experience for us all, and I sincerely believe that our future conferences will become more outstanding if the same spirit is maintained.

Dr. Noor Aishikin Adam

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The Interaction Effect Between Information Management and Innovation Model on Performance of Innovative Startups in Thailand

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Abstract— The purpose of this study is to evaluate the relationship between various levels of information technology management and effective business innovation for the startups in Thailand. The new implication gains from the advantages of information technology management adoption and knowledge sharing that would improve the process of decision making for startups to consider the adoption of information technology management and its open innovation management. The data collection came from the online survey. It was subjected to analyzing by statistical tools. Data was analyzed from research questions which included the descriptive statistics, structural equation modeling, analysis of variance (ANOVA), chi-square test, and multiple regression analysis. The reliability and factor analyses were also added. The results showed that 70.9% of the variation in the firm's performance could be explained by IT management. The variation in the balanced scorecard of the startups could be significantly affected by open innovation. The results from the mediator effect were accepted. Additionally, the mediated effects of open innovation between IT management and firm performance was established.

Keywords—balanced scorecard, firm performance innovation management, information technology management, startups

I. INTRODUCTION

Startups have had three years to make its mark in Thailand. Startup Thailand has been the leading player to support and develop the Kingdom's startup ecosystem while the private sector has encouraged the growth of Thai startups. There is outstanding information, statistics and highlights of the Thai startup scene, reflecting the potential of the country as one of the great global Startup Nations. In 2018, 49% of startups were in the seed stage, 26% were in Series A stage, 9% were in Series B stage, and 6% were bought or taken over. While the total market value of e-commerce in Thailand was 3.15 trillion baht (over US\$101 billion) and expected to increase around 8-10% in 2019 mainly in the B2C sector, which would be around 865 billion baht (about US\$28 billion), which is the highest in ASEAN. Successful startups inspired 36% of the younger generation aged 18-34 to become entrepreneurs (National Innovation Agency, 2019). Currently, there are 1,700 startups registered in the startupthailand.com system. Startups with strong growth are companies in B2B, FinTech, human resource technology and property technology. The highest investment in startup business was in the food and restaurant sector at 14%, e-commerce at 11%, while FinTech, PropTech and Digital Content were at 9% each [1].

Strategic learning and knowledge management have an ongoing research into organizational competence with the emerging theory in competence-based competition. The organizational contexts and organizational dynamics for creating new knowledge are the focus of knowledge creation research. With the greater strategic benefit, knowledge creation could be the consequence resulting from great collaborative knowledge sharing and innovation management. Information technology (IT) is one vital element to creativity which extracts and manages knowledge among several elements in the information systems. Innovation outcomes, products and process innovations, should be taken into account. Additionally, managing to improve innovation could be done by many approaches. Hamel and Prahalad suggested that strategies need to be more engaged in the broader approach that recognizes a company's core competencies. Therefore, traditional management schools might teach their MBA students to keep its core competence and innovation strategy internally [2] while some explore the option of external sources. Such huge revenues and investment comes from the fact that the industry has continuously developed and is adept at value adding. Moreover, food products relate itself to culture, wellness and lifestyle, making use of digital innovations to respond to the needs of consumers and modern society. Innovations and a better manufacturing process - with the help of artificial intelligence (AI) and big data, have been harnessed to produce better, healthier and delicious mass produced food. Modern consumers need easy-to-make yet healthy delicious food for their fast paced and demanding work life. Thus, a startup innovates when it moves beyond its industry – before rivals hit the curve.

Innovation thus has become an essential to the company's competitive advantage [3]. Intellectual Property (IP) is considered the heart of business and it needs legal protections to keep patent trolls at bay. IP is crucial to companies that sell innovations and ideas. Among the industries vulnerable to patent trolls are IT, food, cosmetics and pharmaceuticals.

The purpose of this correlational study is to evaluate between various levels of information technology management and effective business innovation from performance of the innovative startups in Thailand. The intent of this study is to implicate the knowledge that could be applied by researchers and startup businesses to achieve optimal results through the alignment of information technology management and solutions with business model innovation. Moreover, the new knowledge can include the

advantages of appropriated information technology management on knowledge sharing. This would improve the process of decision making for innovative startups. The implication can help the startups to adopt the information technologies and their performance.

II. LITERATURE REVIEWS

A. *Startups in Thailand*

There might be significant differences between startups and well-established organizations. Startups' top management is usually not only worked in the strategic planning but also involved in routine activities. They may or may not have had formal education in any management schools. Sometimes, there are not any strategic plans practiced in the firms. On the one hand, most startups form informal structures and cultures in the organization, which increase cross-functional exchanges and small management teams. An effective decision making can be expected with a micro group or one man.

Another issue startups facing is lack of resources. Since they have less capital compared to large organizations, its employees were hired with lower compensation. With this disadvantage, a company would not have adequate human resources to support a company's basic necessities. Skilled workers are always needed as well as the requirement of extend training programs. In developing countries, many could not afford to pay for external training thus internal trainers will instruct the courses. This solved the problem when the skilled or experienced workers were hired from within the company, otherwise the situation would deteriorate.

Startups that require innovative technology to step ahead of their competitions with lower cost might consider open innovation to be successful [4]. The decision to adopt open innovation in business has to be based on a company's competencies. In this element, startup firms have an agility and flexibility needed, established from ideas and their creators' invention. However, startups lack of precisely what the big firms must spare such as foundation, brand, market space, strengthened partners, intelligent processes, and capabilities to approach global status.

B. *Information Technology Management*

The value of IT management relies on the ability affecting the IT related activities, such as project and system practices, IT evaluation, and control system. IT management signifies managerial forces which are planning, organizing, leading, and controlling of IT within the firm. The IT management also includes planning and design of the information system (IS), IS delivery applications, IT standards and controls [5]. The IT management is intimately embedded in activities and methods in the firm [6]. IT management explains an ability to achieve firms' objectives and react to the environmental changes immediately [7] [8].

As firms increasingly incorporate IT into business operations, IT management becomes a significant capability for firms to prompt respond in the changing business environment. Particular, a superior IT firm can efficiently and effectively employ new applications to modify or redesign firm systems. Firm can maintain out-of-date systems. These accomplishments can help firms to rapidly transform their processes to fulfil goals. Firms can improve the competitiveness over their competitors. This implies that a

firm which has a weak IT management could fail in responding effectively to the changing in business environment. The IT management also contains the effective management of all IT tasks, interaction with societies, and leadership skills [5]. Firms which strong IT management could efficiently organize the different activities across operational units to achieve goals. The goals can be clarified as simplify operation processes and reduction of production costs. Summary, the IT management contributes performance of the startups by empowering and assisting among IT assets in various operational units, numerous IT priorities, and timely reallocation of IT activities [9].

C. *Innovation Management*

The term 'innovation' has become a high power component of policy and strategy as intellectual has become the most important asset of the firm. The intellectual structure of knowledge management could not be ignored. The development of innovation and knowledge management are identified as the opportunities shared for the future which investment is a critical success factor [10].

To achieve the greatest strategic benefit from existing knowledge, there are various operational firms' processes that improve both the creation and application of the IT information to overcome in competitive and cooperative interactions between firms. According to knowledge creation framework discussed earlier, innovation management, strategic alliances and networking will be deliberated both theoretically and in practice on the creation and application of IT information.

D. *Balanced Scorecard*

The Balanced Scorecard or BSC is a management system tool. It is a path of looking at the firm that focuses on the overall element of strategic goals. BSC also helps the firm to pick the right strategy to determine so that firm can reach its goals.

Firms have considered their wealth by how much profit they earn. Financial measures are definitely important, but financial measures only give firms as a part of overall picture. Financial measures focus only on the short-term strategy to approach the goals. However, the name "balanced scorecard" comes from the concept of looking at strategic measures in addition to financial and non-financial measures to get a more "balanced" view of performance [11]. The non-financial measures can get through the long-term strategy of the firms.

There are short-term and long-term strategies that sets the balanced scorecard apart from other firms' performance measures [12]. There are four factors as explain as follows:

1) *Learning and Growth*

The learning and growth perspective focuses on the overall firm culture. Is firm aware of the latest industry trends? Is it easy for staffs to collaborate and share know-how, or is firm a mess of complicated administration? Does employee have access to training and continuing skill improvements?

2) *Internal Business Processes*

The internal business processes perspective focuses at how smoothly firm is operating. The efficiency is very significant in this point. The concept is about lowering waste and running procedures. Are there unneeded barriers between

new ideas and implementation? How quickly can firm adapt to the changing in business environment?

3) Customer

The customer perspective focuses on the persons who purchase products and services from firms. Is firm in the top rank of industry? How about keeping firms' current customers satisfy? How is firm viewed in the industry compared to the competitors?

4) Financial

The financial perspective is important because the balanced look at firm does not mean that firm wants to ignore financial measures. On the other hand, the financial perspective is not a minor element of the balanced scorecard.

The adoption variables with the corresponding hypotheses that were evaluated in the study Fig. 1.

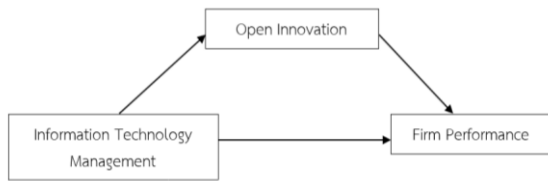


Fig. 1. Conceptual framework

III. METHODOLOGY

This study, multiple regressions was analyzed to answer the objectives. The multiple regression model is as follow:

$$BSC = \beta_0 + \beta_1ITM + \epsilon$$

When β_0 = constant; β_1 = the slope; of the regression linear ϵ = the error

After the initial the panel data was compiled it was decided to target the data using a minimum of 100 subjects. Prior to analyzing the collected data, the 107 completed responses were screened for data normality, linearity, homoscedasticity, multicollinearity, and missing data. Using SPSS 19, the following analysis was conducted using the collected data: descriptive statistics, reliability analysis, analysis of variance (ANOVA), chi-square test, special characters, numbers and some specific words in order to obtain the data in the form of plain text.

IV. RESEARCH RESULTS

The scatterplots of residuals were explored to indicate the linear relationship between dependent variables and independent variables. The preferable method of detection of residual plots of the standardized residuals was examined. As illustrated in Fig. 2 and Fig. 3, the scatter plot was approximately linear thus it met the assumption of the linearity.

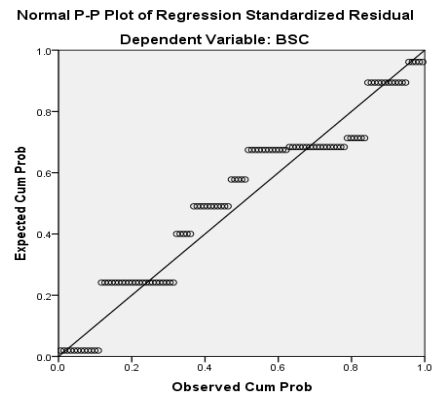


Fig. 2. P-P plot of regression standardized residual

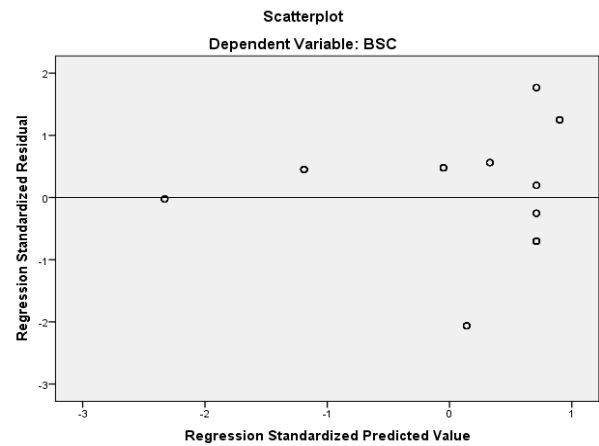


Fig. 3. The residual scatterplot of the standardized predicted value

The assumption was tested with the Durbin–Watson test, the statistic value was 3.008 Table I which is greater than 1 but slightly greater than 3, therefore the assumption was not severe.

TABLE I. MULTIPLE REGRESSION SUMMARY

R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
.842	0.709	0.706	0.27829	3.008

The model, thus the prediction equation could be:

$$BSC = 1.939 + .493ITM + \epsilon$$

The model can predict firm performance.

These results revealed that 84.2% of the difference in the firm's performance. This could be interpreted by IT management. The results showed the existence of positive relationships between the two variable factors and firm's performance.

To predict the firm's performance, these results revealed that 70.9% of the variation in the outcome could be explained by IT management. Moreover, the results showed the existing positive relationships between two variable factors and firm's performance as in Table II.

TABLE II. MULTIPLE REGRESSION SUMMARY

Model	B	Std. Error	t	P-value	VIF
Constant	1.939	.132	14.637	.000	
ITM	.493	.031	15.989	.000	1.000

The innovation was emphasized as the consequences of collaborative software adaptation in the previous scholars [13] [14]. Cloud technology is one of the collaborative enhancement systems, thus external inventions will be expected from IT infrastructure with open innovation management. The results support this argument with a strong relationship between the IT management and a dependent variable, open innovation management. According to Allred et al. [15], the significant change overtime in the external collaboration capability of the organization while the internal collaboration remained consistent across periods of time.

Innovation management literature suggested that collaboration and sharing of knowledge using information technology and communication could generate innovative idea as well as the disruptiveness innovation [16]. Information technology is one supporting tool that could change the way firms do business, especially an exciting opportunity that helps startups to quickly gain business benefits using advance technology. To create the disruption in cost, the integrated external inputs could be a challenge. External and open innovation are two models that could extend the R&D from supplier and customer to overcome this obstacle [17]. Thus, customer and supplier orientation of the organization could also be the consequence of disruptiveness innovation. The results support this argument with the positive relationship between organization orientation and a firm's disruptive innovation as the firm's performance.

Furthermore, the restricted access to technical knowledge, as trade secrets, by restricting manufacturing components internally is a strategy that well-established firms operate on. However, startups would need the alternative to gain competitive advantages, especially cost saving and disrupt the existing market. Supplier orientation or supplier cooperation could be the key to overcoming these challenges. The results revealed that supplier orientation is positively associated with a firm's disruptive innovation. In this study, instead of the functional orientation, the actual use of cloud technology is the input variable while the value creation is the disruptive innovation.

V. CONCLUSION

The factors influencing the startups' performance by management and decision makers in a small and medium size enterprise are established according to the findings. This study brings the IS/IT and related communities closer to an understanding of the factors impact on IT management capability which is in the existing literature by investigating information technology capability in startups.

This study brings the strategic management and related communities closer to an understanding of the factors which impact the disruptiveness innovation and is a significant context that has not been fully studied in the extant literature by investigating open innovation. The idea in the adopting of IT management in Thai startups is also suggested. The mediating effect of open innovation on the relationship

between IT management and firm's performance represents the significant effectiveness for startups.

Additionally, the findings of this study not only contribute to the academic communities but also add the implications to the practitioners that employing IT management and open innovation strategy. Although technicality of the technology is important to know, it is equally important how incorporating and using new technology fits within the organization's structure and strategic plans. Moreover, to survive in the complexity and uncertainty of economics, startups might consider an alternative market as well as improve a firm's ability to successfully introduce a new product to the market. This ability depends not only on its own technological strategy, but also on the innovation system activities performed by other organizations. Thus, with an informal structure of startups and a flexibility of information technology, the disruptive innovation can be a perspective strategy to overcome this obstacle. While established firms are motivated to push innovations to meet the needs of their high-end customers. The startups can bring an easier and less costly strategy to the market. The results of this research indicate that cloud computing usage can impact the disruptiveness innovation when a firm has operated under the high level of open innovation management.

Recommendations for future research are numerous. This research focuses on the only one IT capability dimension which is IT management and the variety of startups as the input of the study framework. Expanding the scope of this survey to include other specific innovative stage could evaluate factors influencing firm's performance. Thus, surveying a larger sample size could yield more thorough results, for example, the comparison of the outcome based on types of business sector.

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