Strategic Approach to Adopt ICT in SMEs

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Abstract

This study investigates the success and failure factors of ICT adoption and usage in Thailand and Japan. In addition, this research aims to establish, derive and come up with an indicative model of identified factors and framework related to successfulness in ICT adoption in SMEs. The factors affecting the risks of ICT adoption faced by SMEs organization consists of three predictors: risk assessment, clear scope of the ICT project and internal management response to project. Finding factors will help the project team estimate the effectiveness of current controls and suggests whether each ICT adoption and usage is potentially failed, potentially succeed, or potentially over-controlled.

Keywords: SMEs, ICT Adoption, Success Factors, System Development, ICT Project Management, ICT Risks

I. INTRODUCTION

Small and medium-sized enterprises (SMEs), including home businesses, are considered to be a crucial part of economic strength of any country. They use application or software as a tool to help their daily operation, such as point of sale (POS), accounting, marketing, inventory, production and web-based tasks. In addition, some SMEs use specialized business software that is designed for their specific industry. Research data from Bank of Thailand [1], show that Thai SMEs share the largest part of Thai enterprises, representing 99.7% of enterprises in Thailand. The GDP value of SMEs in 2014 was 5,212,004 million Baht. Considering in term of the country's GDP, SMEs share the largest part, representing 39.6% of GDP, which 27.8% belongs to small

enterprises and 11.8% to medium enterprises, respectively. From report of the office of SMEs promotion [2] shows that Thai SMEs still lack of awareness in using technology in their business and they believe that it increases the cost of running business rather than builds up their competitive advantage.

In addition, it is not easy for SMEs to implement and apply information system into business, as this involves complementary costs, management issues, training and organizational changes as well as direct costs of investing in hardware and software solutions. Because of the importance of SMEs' business in creating economic strength, both Thailand and Japan are very interested in finding ways to stimulate SMEs in realizing ICT adoption. Many efforts have been made through the government's subsidiary project and organization such as Software Industry Promotion Agency (SIPA) and Software Park Thailand. They still use traditional way to conduct their businesses. Therefore, this study did the first step in devising the right motivation to encourage in using ICT in SMEs by investigating success and failure factors that make us understand how to do the ICT adoption and usage in Thailand and Japan. Development of a software tool could help those working in ICT adoption to understand what they need to do in order to assess and control risks in the ICT project and comply with information system strategies.

For finding these significant factors, we reviewed previous research about success factor determinants in doing SMEs business and factors in ICT adoption for business by covering period from 1996 to 2016. It was found that there were very few

studies dealing with determining factors significant for ICT adoption in SME (as usual in the literature). Most published research studies are dealing with success factors for ERP implementation. In addition, by exploring these determinants, interviews were conducted with the SME's owners and managements from both Thailand and Japan.

II. LITERATURE REVIEWS

From [3], the factors that affect on ERP adoption in organization can be divided into two categories; "characteristics of users and the system" and "organizational issues and system development approaches". However, from our study from different domain, "the factors effected in stimulating innovation in SMEs" [4] are from both internal and external. Thus, we proposed categories in the study where internal variables referred as "characteristics of users and organizational issues" and external variables referred as "system and system development approaches".

For measurement of project success factors, we mapped "characteristics of users and organizational issues" with 7S model, the 7S model [5] suggested that coping with change, organizations need to assess their 7 core values including: structure, strategy, systems, skills, style, staff and shared values as shown in Figure 1.
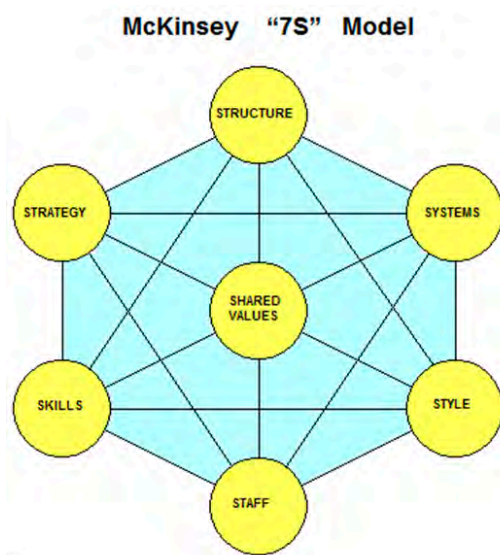

Figure 1: McKinsey 7S Framework [5]

In addition, for success of project implementation, several factors are required to examine the alignment of the project with corporate goals in order to accomplish ICT project with system scoping, system planning, system structure and strategy with risk treatment plan (RTP) [7],[8].

A. Characteristics of users and organizational issues

Our observed antecedents are associated with this 7S model's construction. The factors relating to characteristics of users and organizational issues are explained as following:

• Staff, skill, styles and shared value are considered internal approaches. Today businesses are facing with digital economy phenomenon; they have to monitor their internal operations with these 7S. Internal approaches require cooperation from all employees including executives' involvement. In practice, it is necessary to have belief, positive attitude, and positive behaviour of using ICT. Because all involvements let them clearly understanding by their own without forcing them to do without understanding. The study from OECD also confirmed that two factors that affect the success of ICT adoption are staff and skill. It was found that SMEs with 3-80 employees became success in using ICT by having staff with skills of understanding the technology. Although, SMEs can use outsource, they still need one to run daily operation [6]. Ramayah et al [9] explained in their study that one of several factors in reducing the barriers of website adoption in SMEs is the IS knowledge of IT staffs. They suggested that although firms can use outsourcing for website hosting and external solutions, they still need IS staffs for coping with daily operation. Moreover, attitudes, beliefs, procedures, and value systems of the adopter are necessary for successful implementation. Tovar [10] found an interesting point from his study that SME's manager adopted ICT because they believe that it could help improving their process and they adopt ICT because others have ICT system without a clear understanding of ICT usage. However, he stated that leadership of manager and staffs is essential for successful in technology adoption. Organizations have to create a positive climate to help ICT implementation. For shared value issue, organizations have to give knowledge and awareness to all stakeholders that using ICT could improve decision-making, resulting in better planning, profit, and staffs' happiness.

• Strategy and Style, Management Support and Business Owner involvement: Executives' support is critical issue to the successfulness of the ICT adoption in an organization. Because management's involvement has a responsibility to encourage and take care all relevant tasks in implementation an ICT system for whole project in term of supporting budget, team and rewarding. Without the support of management, the project would not be successful and it may result in timely, costly and out of schedule that lead to negative impact to an organization. Ramayah et al [9] also described in their research that business owners' IT knowledge is one of the key individual context's factors. Business owner's ICT experience is a significant relation to e-Commerce

adoption in Indonesia aligned with several past studies that reviewed by them.   In addition, in another term of management "CEO", he/she is a very important person in ICT adoption, his/her positive attitude in technology perception could affect the success factors the continuity of website adoption.

B.   System and System Development Approaches

• System Scoping: To determine a clear schedule of ICT implementation plan is the heart of project. Moreover, project scope is also important for success, too big scope of ICT project especially for SMEs is a high risk, then if SME can start from small part of system and expand it later, chance of success will be higher. Many scholars [11]-[13] agreed that work schedules with adequately defined tasks ensure the success of the project implementation. In addition, the meaning of controlling of good scope is that project have to be measured the schedule over/underrun as a percentage of the initial estimate [11].

• System Planning: The project management plan is also an important part of ICT adoption. For good controlling of project, SMEs need to scan the real resources and capability of an enterprise. The right time and resources should be assigned properly for suggested period of 9-12 months. Turner et al [13] explained in their research that SMEs need a lite version of project management. However, because of the need to coordinate the work of specialists, medium-sized companies need more formal processes than micro-sized and small companies do. Moreover, Munns and Bjeirmi [12] stated that the project team is the key success factor in project implementation. Because they are key persons who directly apply techniques to make sure that planning, controlling and communication systems are on plan. Thus, the project planning and team are very important to success and failure to ICT adoption process.

• System, Structure and Skill: The flow of communication in the successful project, a communication within project team is one of several key factors that organizations have to monitor. All stakeholders should understand how to correctly communicate formally and informally. To achieve a common understanding of the ICT adoption, project manager should contact stakeholders and update information of project regularly.   Moreover, the related formal communication is required and it is one of the key significant factors that help in tuning an attitude of all stakeholders in project team [7],[8]. For Risk Assessment Strategy, SMEs have to add risk management tasks in ICT adoption project and it is important to have Risk Treatment Plan (RTP) to ensure that project leader has aware of it with risk action plan, to reduce risks. The risk management approach is a process consisting of identification, analysis, response, monitoring, and control.   It was found that risk

management planning positively helps in predicting the project duration and its success. Risk management task is including of listing the characteristics of the risk management process of a particular project which involves the following issues for example "who will participate in the risk identification, which tools will be used, how should the risks be reported, who will receive this information, and what is expected of them" [13], [14].

• System Documentation, System Development Life Cycle (SDLC): The ICT adoption project needs documentation because it gives evidences to all project's activities not only for audit, checklist or disputes, but also for rules and regulations. It helps project running systematically and ethically. The documentation process helps team in remembering what they have done on a daily basis and also reduces confusion, conflicts with employee and misquoted information.   The documentation process includes the record of incidents, meetings, history of system modification and this record could support in project implementation.   In addition, if SMEs do a good documentation system, it will help in better decision making, reducing slow the process down and gives the manager time to consider what actions are appropriate. Moreover, it can help manager see the problem clearer. The most important role for documentation is to prevent a lawsuit.   [15]

• Staff: Consultant: "A consultant is a trusted professional advisor." Hiring and maintaining full time IT staff is a very difficult task for SMEs, however, IT tasks are getting high required for today's business climate.   Good IT staffs are very costly and have a high rate for turning over in job. In addition, in term of ICT project management tasks, especially in SMEs, they do not have much experienced for project controlling and performance matrix which focus on cost, time, quality and performance [16]. Thus, they need to outsource IT to trusted consultants for ICT adoption. With their singular business focus and specific knowledge, they can save money from other benefit payment such as health insurance, provident fund and vacation leave. SMEs can get efficient ICT solution without wasting time and allowing SMEs to work on other aspect of business. Thus, for avoiding a gamble on having a poor IT staff, this solution can help SMEs reach the most cutting-edge ICT solutions and techniques that keep SMEs at the forefront of their game [17].

• Staff, Custodian and End User Involvement: User and custodian involvement is one of the key success factors to successful system development [18].   Advanced users are able to shape ICT technologies based on their status, their needs and their ability to propose new solutions.   In addition, Eichhorn [19] stated that user involvement gathering functional requirements positively impact on user satisfaction.   However, many studies showed that user involvement to system success has both positive and negative

results [20]. They explained in their research that user involvement in the systems development process is very important to system success. Research team further identified several key points pertinent to making user involvement effective.

From aforementioned literature reviews, summary of factors based on categories are shown in Table I, II, and III.

TABLE I : CATEGORIES AND FACTORS EXAMINED IN THE STUDY

Category	Factors	Number of Indicators
Characteristics of users and organizational issues	1. Staff, Skill, Styles and Shared Value: Internal Approaches 2. Strategy and Style: Management Support and Business Owner involvement.	7
System and System Development Approaches	System Scoping System Planning System, Structure and Skill Strategy: Risk Assessment System Documentation: System Development Life Cycle (SDLC) Staff: Consultant Staff: Custodian and End User Involvement	37
		44

TABLE II: CATEGORIES AND FACTORS EXAMINED IN THE STUDY

Category	Factors
Internal Approach - Staff - Skill - Styles - Shared Values	Firms need cooperation from all employees including executives' involvement. Styles and Share values should be clearly understanding by their own without forcing them to do without understanding.
Strategy and Style: -Management Support -Business Owner involvement.	System Scoping System Planning System, Structure and Skill Strategy: Risk Assessment System Documentation: System Development Life Cycle (SDLC) Staff: Consultant Staff: Custodian and End User Involvement

TABLE III: Factors: System and System Development Approaches

Factors	Factors definitions
System Scoping, System Planning	A clear schedule of ICT implements.
System, Structure and Skill	System Scoping System Planning System, Structure and Skill Strategy: Risk Assessment System Documentation: System Development Life Cycle (SDLC) Staff: Consultant Staff: Custodian and End User Involvement
Strategy: Risk Assessment	A process consisting of identification, analysis, response, monitoring, and control.
System Documentation: System Development Life Cycle (SDLC)	An evidence to all project's activities.
Staff: Consultant	Trusted consultants who are clean in ICT adoption.
Staff: Custodian and End User Involvement	User involvement in ICT project.

III. METHODS

The research design for this study follows procedures suggested in Business Research Method [21]. First, based upon the objectives of this research, research team selected industry sector for narrowed samples. Second, research team applied both quantitative and qualitative research methodologies for conducting this research for finding success and failure factors in ICT adoption for SMEs.

The data in this research were collected from both Thai and Japanese SMEs, depending on 2 main characteristics of each country such as number of employees, fixed assets. The data were collected by Google form survey and by interviewing over the period from the beginning of 2016 to the end of 2016.

The classification of small and medium sized enterprises is based on the Promotion of SMEs by the Small and Medium Enterprise Promotion Act 2000 (2010) which is presented below in Table IV.

TABLE IV: CLASSIFICATION OF SAMLL AND MEDIUM SIZED ENTERPRISES

Type of Business	Small	Medium
	Employees, Fixed Assets (Baht)	
Manufacturing	<50, <50 Million	>50<200, >50 Million < 200 Million
Service	<50, <50 Million	>50<200, >50 Million < 200 Million
Wholesale	<25, <50 Million	>50 Million < 100 Million
Retail	<15, <30 Million	>30 Million < 60 Million

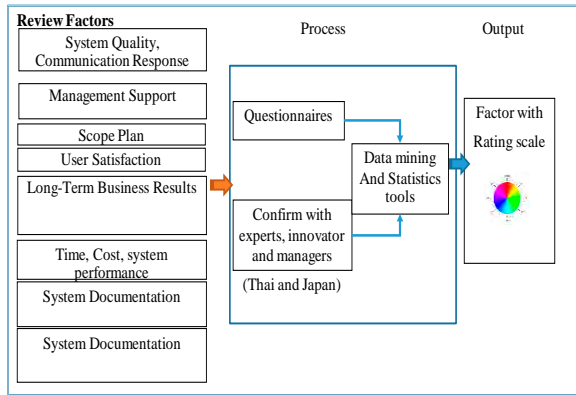Our proposed research framework is presented as follows:

Figure 2: Research framework

From Figure 2, samples of questionnaires were a group of SMEs that are in food, supplement, automotive assembly line, manufacturing with R&D and retail store. Population is the Thai and Japanese SMEs that are 2.74 million [2] and 4.7 Million which equals to 7,429,609. The questionnaires' target group were both Thai SMEs and Japanese's SMEs. From the Yamane formula, in case of population over 100,000 units, the minimum of 400 samples are required. Thus, data collection was planned to gather 350 survey data from Thai SMES and 50 survey data from Japanese SMEs. In addition, an in-depth interviews were also conducted in this study with 3 companies in Thailand and 5 companies in Japan. After data cleansing and examining, 404 firms were used in this research. The response rate for the service sector was 37.9%, while the response rate for the manufacturing sector was 17.6%, whereas 20.8% was from retails and wholesale.

In this study, we defined a list of possible factors that have potential success in ICT adoption. Our objective is to find those factors that have significant impact on ICT adoption in SMEs organization.

The study approach in this study starts with several data analysis methods as following;

1) Analytic Induction: after research team have collected data, then research team created a temporary concluded data for illustration of the relationship of preliminary factors.

2) Typological Analysis: by organizing information into categories.

3) Data analysis and data interpretation with statistical tool [22] and data analytics using classifying tree. A CHAID [23] classification tree is one of decision tree. CHIAD uses chi-square statistical test to limit tree growth. If the chi-square test is significant, a new partition (child node) is created. Branch splitting stops when purity improvement is not statistically significant. This method for the best split is often based on the degree of impurity of the child nodes. The following is formulation that used for impurity.

The Bonferroni multiplier B is the number of possible ways that I categories can be merged into r categories. For r = I, B = 1. For $2 \le r < I$, use the following equation

$$B = \begin{cases} \dbinom{I-1}{r-1} & \text{Ordinal predictor} \\[2em] \displaystyle\sum_{v=0}^{r-1}(-1)^v \frac{(r-v)^1}{v!(r-v)!} & \text{Nominal predictor} \\[2em] \dbinom{I-2}{r-2}+r\dbinom{I-2}{r-1} & \text{Ordinal with a missing category} \end{cases}$$

IV. RESULTS

Bivariate relationships between independent factors and dependent variables was applied for our examining and it shows that factors that highly impact to success in ICT adoption, after training available, system improvable (adaptable), system data supporting business decision and user's self-report generating from system as shown in table V.

TABLE V: RELATIONSHIP BETWEEN FACTORS AND SATISFACTION IN ICT ADOPTION

Factors	ICT Adoption Satisfaction
Internal management support	.463
Internal management motivation	.393
Internal management plan	.463
Internal management scope	.425
Internal management duty	.429
Internal management response	.463
Internal management follow-up	.413
User understanding scope	.481
User involved in plan	.455
User involved in project	.460
User involved in design	.418
User involved in scope	.449
User involved in test	.406
User involved in audit	.468
User involved in result follow-up	.432
Project align vision	.483
Project align target	.448
Project align strategy	.439
Project align business requirement	.454
Project clear activity	.483
Project clear schedule	**.508**
Project clear scope	.495
Project communicate clear on duty	.409
Project communicate clear on response	.476
Project owner clear on project duty	.391
Self-document generating	**.501**
Document problem solve by yourself	.457
System consult by yourself	.474
System suggestion by yourself	.454
Data support business decision	**.508**
Accuracy Data	.449
Data support all processes	.382
Data support all departments	.487
Administrator know system	.493
Administrator solve system problem	.491
consult available	.425
Training available	.472
Time allocation available	.476
After Training available	**.545**
Continuous improve available	**.531**
System know by yourself	.495

Although factors used in this research based on previous work from large business environments, our data also support that if software vendor provides training service, this can increase a success in adoption an ICT project.

In this research, we do not observe the relation between each factor to the real success in implementation due to limited of time. However, we used classification techniques for predicting data sets. This tree algorithm can be used to identify a model that best fit the relationship between factors and class label of the data.
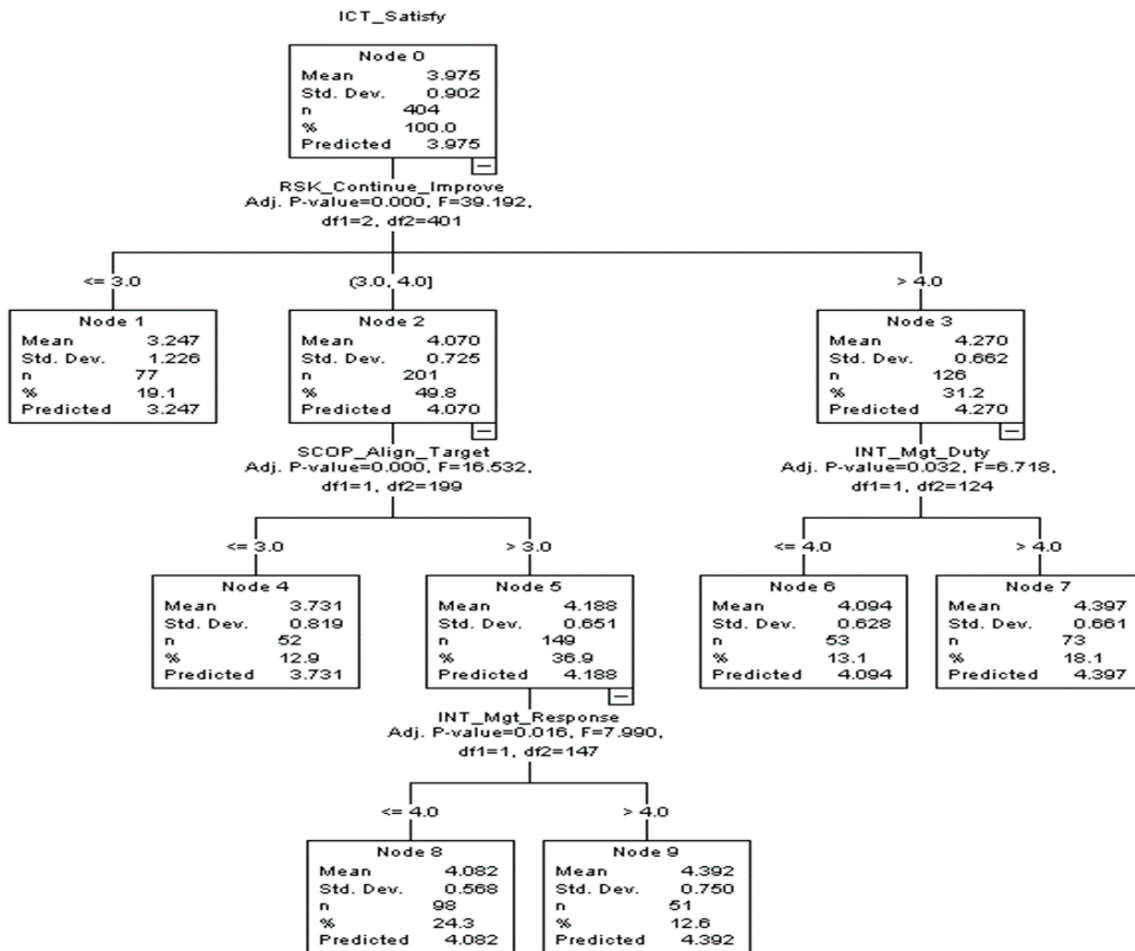
Figure 3: Classification by Tree

From our visual trees, it shows the relationships that are hidden in our data set. The figure 3 presented all possible splits for each predictor. From using the CHAID method, management response in project is the best predictor of success factor for ICT adoption in SME organization since there are no child nodes below it, this is considered a terminal node.

From this model, it includes three predictors: Risk Assessment, Clear Scope of the ICT project and Internal Management Response to project.

It implies that for successfully implementing ICT project, we should consider on these three factors respectively.

TABLE VI: RISK ESTIMATION VIEW

Estimate	Std. Error
.644	.080

Growing Method: CHAID Dependent Variable: ICT Satisfaction

The estimation of the risk is reflected as 0.644 or 64.4%. This value shows that the "risk" of misclassifying for the ICT adoption success factors is approximately 64.4%. It can explain that SME organization's management decision generally based on owner. Thus, this value may imply for this situation in adoption ICT project.

V. CONCLUSION, DISCUSSION AND FUTURE WORK

This study did an exploratory research using both quantitative and qualitative method to find and draw the modelling framework of factors that affected to successful adoption of ICT in SME companies. The result reveals that the small and medium firms have low usage due to the high cost of required investment, limited of skill and knowledge to ICT. The finding further indicates that SMEs considers software that has a training support as well as an ability to modify software if needed. This finding requires government to formulate policies that address these barriers. The following are derived from the study

1. SMEs are still unclear about the benefits of ICT and risk in adoption. Thus, risk management should be applied to project to make sure on concrete and realistic targets.

2. ICT training is required for adoption both before and after.

3. Clear scope of ICT project is also needed.

Thus, government can help SMEs by further offering subsidies and encouraging SMEs for ICT training. Moreover, government should partner with big ICT companies to provide technical expertise, training workshops as well as pre-diagnostics for ICT adoption project.

The future study will focus on different group, industry and country for analyse how it different from finding results in this research. In addition, this study will continue to propose and apply results to SMEs promotion policy for both private and public sectors. Finally, researcher will develop interactive software tool prompts managements to collect real significant factors in ICT project with decision support whether they need to be doing more to control the risks of the ICT adoption and usage in SMEs. The future software tool will help the project team make a decision to manage the ICT project quickly and easily.

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