# AN EMPIRICAL STUDY OF FACTORS INFLUENCING THE ADOPTION OF ELECTRONIC COMMERCE TECHNOLOGIES BY SMALL AND MEDIUM ENTERPRISES IN THE KINGDOM OF THAILAND

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**ABSTRACT**

This paper aims to investigate factors which have influences on the adoption of electronic commerce technologies (ECTs) by small and medium enterprises (SMEs) operating in Bangkok, Thailand. The ECT experiences of the SMEs are used as the factors to measure the adoption. The results found that there are slightly influences by the four main factors: business environment, knowledge, organisation, and technology toward ECT adoption.

***Index Terms***—Thai SMEs, E-Commerce Technology Adoption, ECT Adoption, Thailand E-Commerce

## 1. INTRODUCTION

This paper focuses on the study of the factors which influence the adoption of electronic commerce technologies (ECTs) by small and medium enterprises (SMEs) in Thailand. This research has adopted quantitative approaches in the study. Relevant models are examined and verified in this study in order to evaluate the applicability of such models from the perspective of Thailand. The study directs to the consideration and contribution of knowledge for the Thai's SME sectors with respect to ECTs and their adoption. The finding is anticipated to benefit the Thai SMEs community by empowering and assisting them to:

a) develop and implement ECTs;
b) engage in globalisation business via e-commerce; and
c) comprehend issues related to e-commerce entrepreneurship in both national and international levels.

In 2002, the Thai government has endorsed an information technology policy framework entitled ***"Thailand Vision towards a Knowledge-Based Economy (IT 2010)"***. The policy framework is expected to be put in place and followed until 2010. The IT 2010 policy emphasises the roles of information technology for the enablement and facilitation of economic and social development. The five areas of information technology development highlighted in the policy are: e-government, e-industry, e-commerce, e-education, and e-society. In addition, the policy framework also aims to develop the information technology industry in Thailand [1].

E-commerce is acknowledged by the Thai government that it has the ability to increase business opportunities, decrease transaction costs, augment competence, improve the quality of life, and assist SMEs to exploit new opportunities in the new global economy [2]. Tangkitvanitcha [3] pointed out that the Thai government has to support SMEs by contributing to their website development. The free public web portal for industrial sector should include various functions such as group discussion, directories, public relations, information provision, and transaction. However, Jutla, Bodorik and Dhaliwal [4] state that in order to develop a country, the government's support for e-business in SMEs is an important tool for the development. Therefore, the government has to develop precise policies and relevant laws on issues such as transactions, authentication, certification, security, deception, and consumer right. The other important aspects are issues related to ICT facilitation, finance, transaction of commercial entities, and encouragement of confidence in e-commerce use. Out of the above, one of the government's objectives is to develop the ability of Thai entrepreneurs to compete with other countries in the world market. The emphasis is placed on e-commerce for exportation, trade, services, and domestic consumption. As regard to IT 2010, the government has already set policies or the 'E-Commerce Policy Framework' for developing e-commerce in Thailand [1].

Within the framework, diverse business sectors are expected to contribute to the development of electronic businesses in Thailand. Within this context, E-commerce is defined as a sub-system and an important mechanism that will drive and equip the traditional businesses for the global market. At present, many Thai businesses have started using Internet technologies and e-commerce applications to promote their products and services to customers all over the world directly. Kittikanya [5] reported that e-commerce is transforming the features and characteristics of Thai businesses, and many large companies are using e-commerce as an essential tool to put them in a strong position to take advantages of business-to-business (B2B) links. He also pointed out that e-commerce values in Thailand are expected to surge, but the level of growth is in dispute among the analysts. Smith [6] indicated that SMEs' demand is the ICT implementation for competitiveness, entrepreneurial confidence, and acceptance from customers. In addition, he suggested SMEs should invest in ICTs, improve skills in the use of ICTs, and develop consumer security systems. Moreover, creative promotion, ease of use and simple functions are highly demanded in SMEs e-commerce [7].

The aforementioned aspects are correlated with the survey results from the Kasikorn Research Centre Co., Ltd. [8]. The results showed that Thai dot com (.com) businesses are not competitive with the global dot com businesses. However, the Thai dot com businesses are growing steadily despite the lack of infrastructure capacities. Moreover, the Electronic Commerce Resource Centre (ECRC) of Thailand [9] stated that the barriers of e-commerce entrepreneurship in Thailand are in two aspects: *customers' problems* and *technical problems*.

The customers' problems are composed of:

a) customers only come to visit e- commerce website and they do not carry out transactions,
b) they are not accustomed to online transactions,

c) they do not comprehend e-commerce,
d) they have no credit cards,
e) they are not confident about the security of the payment systems,
f) they cannot compare the quality of services and transactions because of the low number of Thai e-commerce operations and subsequently there are little choices,
g) no definite standard online-pricing mechanism for the commodities, and
h) non-efficient delivery systems.

The technical problems are:
a) Website development is confronting with many barriers such as manpower, management, budget, etc,
b) investment for Website development is limited,
c) commercial banks do not support e-commerce transactions,
d) problem about using Web technology,
e) low efficiency of the telecommunication systems,
f) little support from the government, and
g) legislation of relevant laws[1] are enacted and some are still on process.

The development of e-commerce in Thailand continually faces the following challenges:
a) the number of Internet users in Thailand is only 6.97 millions which is relatively low as compared to the country's population of 62 million [10],
b) inadequate e-commerce regulations and laws,
c) lack of national information infrastructure due to low bandwidth and this causes major barriers to the expansion of internet services,
d) lack of skilled officials in information technology and,
e) lack of English competency limits the ability of Thai e-commerce sites to reach out to the world.

In addition to the above challenges, the main factors that affect e-commerce development in Thailand are the entrepreneurs and business owners. This is due to their lack of precise understanding and their inability to apply e-commerce technologies to improve their business performance and operations. The effort to overcome this barrier therefore forms the main motivation of this study.

In summary, business environments in Thailand still encompass barriers for sustainable progress of electronic commerce such as ***low consumer confidence*** in electronic commerce [11], ***non-collaboration*** amongst business and industrial sectors, and the ***lack of entrepreneurs' comprehension*** with regard to e-commerce possibilities and benefits [12]. Therefore, it is fair to say that Thai SMEs sector is only beginning to focus on a pathway to join the global business market. However, the Thai e-commerce framework and its implementation in the SMEs sector are still lingering in the development stage. It is the intention of this study that an in depth understanding of the drivers and their influences will be achieved. This will help to propel Thai's SMEs sector to a new level of success.

## 2. RESEARCH FRAMEWORK

According to Wymer and Regan [13],

> *"...the research on e-commerce/e-business Internet technology (EEIT) innovation and adoption by SMEs applies a variety of theoretical models and foundation from diverse disciplines. No single model or theory dominates."*

Therefore, this study is based on the combination of a variety of approaches and theoretical frameworks which are as follows:

a) **Diffusion of Innovation Model** [14, 15]: Rogers defines diffusion as the "*process by which an innovation is communicated through certain channels over a period of time among the members of a social system*"; moreover, he describes an innovation is "*an idea, practice, or object that is perceived to be new by an individual or other unit of adoption*"; and he further explains communication is "*a process in which participants create and share information with one another to reach a mutual understanding*".

b) **Technology Acceptance Model (TAM)** [16-25]: This model is originated in the Theory of Reasoned Actions (TRA) [26, 27] in psychology area. TAM posits that perceived ease of use (PEOU) and perceived usefulness (PU) of technology are predictors of user attitude toward the using of technology, subsequent behavioral intentions, and actual usage.

c) **Theory of Reasoned Action (TRA)/Theory of Planned Behaviour (TPB)** [27-31]: The TRA relates to voluntary behavior in which an individual's behavior is determined by his/her intention to perform the behavior. The intention means a function of an individual's attitude towards the behavior and his/her subjective norm. The TBP concerns with the prediction of deliberate behavior, and beliefs that behavior can be planned.

d) **Social Cognitive Theory (SCT)** [32-40]: The SCT identifies human behavior as a triadic, dynamic, and reciprocal interaction of personal factors, behavior, and environment. Therefore, an individual's behavior is determined by these three factors, and "*the mind is an active force that constructs one's reality, selectively encodes information, performs behavior on the basis of values and expectations, and imposes structure on its own actions*" [37].

e) **Unified Theory of Acceptance and Use of Technology (UTAUT)** [16-18, 41, 42]: UTAUT is formulated by integrating eight technology acceptance models: TRA, TAM, TPB, Motivational Model, Combined TAM-TPB, Model of PC Utilization, Innovation Diffusion Theory, and SCT.

Regarding the aforementioned aspects, the research model was developed as shown in the following figure.

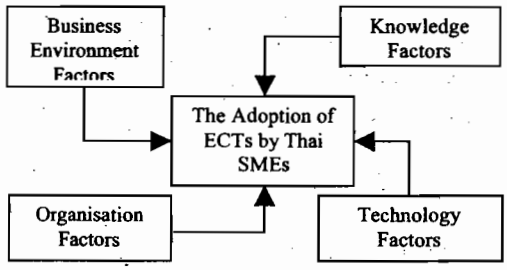


Figure 1 A Model of Factors Influencing ECT Adoption by SMEs in Thailand

Figure 1 draws the four main factors which are hypothesised to influence the adoption of ECTs by Thai SMEs. The factors are business environment, knowledge, organisation, and technology. In additional, some SMEs' background is

[1] Data Protection Law, Computer Crime/Computer-Related Crime Law, Electronic Data Interchange Law, Digital Signature Law, Electronic Funds Transfer Law, Bylaw of Section 78 of the Thai Constitution (Universal Access Law) in order to create an equitable information society by promoting universal access to information in the National Information Infrastructure (NII).

designed as supporting factors such as the number of employees, number of years in business, experiences in e-commerce, gender of SMEs' owners who responded to the questionnaires, etc. are inserted in the model. The inserted variables are used to study whether these background factors differ significantly on the influence. The following table shows the variable definitions based on Wymer and Regan [13].

Table 1 Factor Descriptions

| Factor Name | Factor Description |
|---|---|
| **Environment Factors** | |
| Competitive Pressure | Competitive pressure from other Internet adoption within my industry |
| Government | Government rules and regulations |
| Market | Viable market or customer base e-commerce |
| Partners/Vendors | Availability of the right partners with whom to work |
| Supplier Readiness | Readiness of Suppliers for electronic business |
| **Knowledge Factors** | |
| Change Experience | Employee experience with making major changes |
| Executive Experience | Experience of top executives with computers and the Internet |
| Innovativeness | Your company's willingness to about new technology |
| Models | Models of successful use in my industry |
| Need | Perceived need for change or implementation of Web and Internet Technologies |
| Prior Experience | The company's prior experience with new technology implementations |
| Trust | Trust or confidence in Web and Internet Technologies |
| Understanding | Understanding of available opportunities and options with e-commerce |
| Value | Perceived value or relevance to the business |
| **Organisational Factors** | |
| Capital | Access to capital for start-up |
| Employee Reduction | Resulting reduction in number of employees |
| Priority | Priority relative to other projects that require existing resource and time |
| Profitability | Projected profitability of e-commerce |
| Technical Expertise | Availability of technical staff or consultants with web-skills |
| **Technological Factors** | |
| Cost | Cost of setup and maintain |
| E-commerce Technology | Technology for selling products or service online |
| Infrastructure | Access to network services or infrastructure to support Web and Internet Technologies |
| Reliability | Reliability of Web and Internet Technologies |
| Security | Security issues |
| Technology Availability | Availability or adequacy of existing technology and tools |
| Other | Other |

Table 1 shows the main variables in details. These variables were used for designing the items in the questionnaire for gathering data from the SMEs located in Bangkok and the provinces around.

There are four hypothesises derived from the model:

$H_1$: business environment factors influence the ECT adoption when measured by e-commerce experiences of the SMEs

$H_2$: knowledge factors influence the ECT adoption when measured by e-commerce experiences of the SMEs

$H_3$: organisation factors influence the ECT adoption when measured by e-commerce experiences of the SMEs

$H_4$: technology factors influence the ECT adoption when measured by e-commerce of the SMEs

## 3. RESEARC METHODOLOGY

### 3.1. Samples and Demographic Distribution

The research population is composed of 845,064 SMEs entrepreneurs in Thailand; however, the study focuses on retailing SMEs entrepreneurs which are 30% of the total of SMEs firms (259,310 retailing firms) [43].

The sample size of the population was drawn from the sample size estimation formula of Taro Yamane [44]. The sample size was defined at the degree of the precision level at ±5 % where confidence level is 95 %. By this, 400 firms will be used as representative samples for the retailing SMEs located in Bangkok and surrounding areas in Thailand.

### 3.2. Research tool

The research tool used in this study is questionnaire. This was designed and developed from the research model shown in Figure 1. The questionnaire aims to gather data from SMEs located in Bangkok and its surrounding provinces in Thailand. After the questionnaire has been completed—all items have been arranged in a structured order and with introductory instructions. The questionnaires were sent to the three experts in e-commerce and SMEs in order to check the validity of the entire content and items included in the questionnaires. The experts have agreed with the content and they have given their suggestions to improve some of the items.

Consequently, the questionnaires were translated into Thai. After the Thai questionnaires have been completed, twenty copies of the questionnaires were sent to the SMEs in order to carry out a pre-test. The pre-test results show that the participants understood the questions, the scales in use, and the general instructions.

The questionnaire consists of five parts according to the research model:

Part A contains five items concerned with business environment factors which may or may not influence the ECT adoption by the SMEs.

Part B contains twelve items concerned with knowledge factors which may or may not influence the ECT adoption by the SMEs.

Part C contains five items concerned with organisation factors which may or may not influence the ECT adoption by the SMEs.

Part D contains five items concerned with technology factors which may or may not influence the ECT adoption by the SMEs.

In the end of each part mentioned above, it has an opened ended item for the participant to provide further comments.

Part E contains items concerned with the SMEs' background such as the number of their employees, the number of years in business, gender of SMEs' owners who respond the questionnaire, e-commerce experiences, e-commerce activities, owning the website, whether they own the domain name, and any plan to implement e-commerce systems.

### 3.3. Data compilation

The SME respondents were asked to complete the questionnaires themselves, in other words, self-administered questionnaires were adopted. The questionnaires were distributed to the respondents by hand, post and e-mail. The SMEs were picked up from the list of registered SMEs from a directory published by the Thailand Ministry of Commerce. They were then requested to return the forms anonymously either by mail or email.

### 3.4. Data analysis

SPSS application and appropriate statistical techniques were used to process the data from the returned questionnaires. Statistic Scales of Measurements used are listed as follows:

a) nominal Scale: frequency distribution, percentage,
b) interval Scale: arithmetic mean, standard deviation, and
c) statistical significance test: regression.

The scale lengths for measuring level of influence of factors and customer behaviours towards electronic commerce technology adoption by Thai SMEs are composed of the following seven levels:

2.01 to 3.00 represented extremely likely influence
1.01 to 2.00 represented quite likely influence
0.01 to 1.00 represented slightly likely influence
0.00 represented neither likely influence nor unlikely influence
-1.00 to -0.99 represented slightly unlikely influences
-2.00 to -1.01, represented quite unlikely influenee
-3.00 to -2.01 represented extremely unlikely influence

## 4. FINDINGS

### 4.1. Descriptive statistic results

209 SMEs (52.25%) returned the questionnaires from the distribution of 400 questionnaires. It found that almost SMEs (149) have used or implemented ECTs in their business (71.98%) and only 58 SMEs have never used or implemented ECTs in their business (40.49%).

This section presents the results from the analysis of the descriptive statistics measuring the four factors which influence the adoption of ECTs by Thai SMEs. The measurement based on the mean and standard deviation. Table 2 to 5 present the results and interpretation.

Table 2 Influence Levels of Business Environment Factors

| Business Environment | Mean | SD. | Interpretation |
|---|---|---|---|
| 1. Your business competitors have implemented the Internet technology and have access to technical personnel and specialists in Web and the Internet technology | 1.46 | 1.27 | quite likely |
| 2. Government policies on the e-commerce and the Master Plan – "Thailand Vision Towards a Knowledge-Based Economy (IT2010)" and the related rules and regulations | 1.46 | 1.29 | quite likely |
| 3. Continual increasing availability of online access by the population in both urban and rural urban areas | 1.91 | 1.28 | quite likely |
| 4. Adoption of e-commerce technology by business partners | 1.27 | 1.33 | quite likely |
| 5. Readiness of suppliers for electronic business | 0.96 | 1.44 | slightly likely |
| Total | 1.42 | .88 | quite likely |

Table 2 shows the mean and standard deviation of influence level of business environment factors, which effect the ECT adoption by the SMEs. Totally, these factors influence the adoption quite likely at the average rating 1.42. There is only one sub-factor, *"readiness of suppliers for e-business"*, received the lowest rating scale at 0.96—it means that this sub-factor is likely to influence the adoption of ECTs slightly. There are four sub-factors influence the adoption of ECTs by the SMEs at quite likely scale. The sub-factors are as follows;

a) *"Continual increasing availability of online access by the population in both urban and rural urban areas"* received the highest scale at 1.91,

b) *"Your business competitors have implemented the Internet technology and have access to technical personnel and specialists in Web and the Internet technology"* and *"Government policies on the e-commerce and the Master Plan – Thailand Vision Towards a Knowledge-Based Economy (IT2010) and the related rules and regulations"* received the equal scale at 1.46, and

c) *"Adoption of e-commerce technology by business partners"* received the lowest scale in this group at 1.24

Table 3 Influence Levels of Knowledge Factors

| Knowledge Factors | Mean | SD. | Interpretation |
|---|---|---|---|
| 1. Your employee has prior experience or involvement with the process of changing from traditional business to online business | 1.28 | 1.34 | quite likely |
| 2. The managers in your organization have experience with ICTs | 1.73 | 1.04 | quite likely |
| 3. You are enthusiastic to adopt and experiment with new and innovative technologies | 1.89 | 1.20 | quite likely |
| 4. There are models of successful use in other companies in your industry sector. | 1.07 | 1.41 | quite likely |
| 5. Perceived need to change and implement ECTs - Web and Internet technologies | 2.10 | 1.06 | extremely likely |
| 6. Your company has prior experiences with new technology implementation | 1.73 | 1.02 | quite likely |
| 7. You have trust and confidence in ECTs | 1.82 | 1.31 | quite likely |
| 8. Your understanding of the available opportunities and options with ECTs | 1.81 | 1.20 | quite likely |
| 9. Your perceived value or relevance of ECTs with respect to the business | 1.85 | 1.18 | quite likely |
| 10. Adequacy and variety of information resources on ECTs | 1.78 | 1.34 | quite likely |
| 11. Adequacy and variety of communication channels for the implementation of ECTs | 2.24 | 0.94 | extremely likely |
| 12. Need for frequent communication between your firm and your trading partners | 1.31 | 1.43 | quite likely |
| Total | 1.68 | .80 | quite likely |

Table 3 shows that the descriptive statistic which derived the mean and standard deviation of the 12 sub-factors of the knowledge factor. On the whole, the knowledge factors influence the adoption of ECTs at quite likely scale (1.68). There are two sub-factors, which received the highest influence to the ECT adoption, *"adequacy and variety of communication channels for the implementation of e-commerce technology"* and *"perceived need to change and implement e-commerce technologies - Web and Internet technologies"* at the average rating scale 2.24 and 2.10 in ascending order. It is fair to mention that the two sub-factors influence the adoption at the level of extremely likely.

Table 4 Influence Levels of Organisation Factors

| Organisation Factors | Mean | SD. | Interpretation |
|---|---|---|---|
| 1. Availability of capital for starting-up e-commerce systems | 1.58 | 1.16 | quite likely |
| 2. Reduction in the number of employees by implementing e-commerce systems | 0.57 | 1.76 | likely slightly |
| 3. Perceived higher priority of the e-commerce project over other projects that require existing resource and time | 1.62 | 1.35 | quite likely |
| 4. Management support for setting up and implementing e-commerce systems | 1.83 | 1.29 | quite likely |
| 5. Contribution by government, professional or business associations (e.g. Office of SME) in raising the awareness and facilitating the implementation of e-commerce technology | 1.81 | 1.21 | quite likely |
| Total | 1.48 | .76 | quite likely |

In Table 4, almost all organization sub-factors influence the ECT adoption by the SMEs at the quite likely scale between average rating 1.58 and 1.83. However, as a group, the organization factors influence the adoption at the quite likely scale 1.48.

Table 5 Influence Levels of Technology Factors

| Technology Factors | Mean | SD. | Interpretation |
|---|---|---|---|
| 1. Cost for setting-up, installing and maintaining the e-commerce systems | 1.49 | 1.14 | quite likely |
| 2. Advancement of e-commerce technology which enables the selling of products and servicing online customers | 2.04 | 1.18 | extremely likely |
| 3. Availability of Internet and E-commerce infrastructure such as wired or wireless communication, bandwidth, network service, gateway and Internet service provider | 1.83 | 1.27 | quite likely |
| 4. Availability and adequacy of existing e-commerce technology and tools | 1.71 | 1.25 | quite likely |
| 5. Complexity and intricacy of e-commerce technology | 0.95 | 1.68 | Slightly likely |
| Total | 1.60 | .85 | quite likely |

In Table 5, the sub-factor of the technology factors, "advancement of e-commerce technology which enables the selling of products and servicing online customers," received the highest average rating scale at 2.04. It means that this sub-factor influence ECT adoption by the SMEs at likely extremely level. Entirely, the technology factors influence the adoption at the quite likely scale 1.60.

### 4.2. Regression analysis

In this section, the regression techniques designed to select the most important value for prediction of dependent variable is the "enter" method. By this method, the e-commerce or the Internet experiences of 149 SMEs (72%) become the biggest groups of the entire SMEs chosen as variables for the measurement. The followings are the test results shown in Table 6 to 9.

*$H_1$: business environment factors influence the ECT adoption when measured by e-commerce experiences of the SMEs*

Table 6 Coefficients of Business Environment Factors influence the ECT Adoption of Thai SMEs measured by E-commerce Experiences

| Model | Business Environment Factors | Unstd. Coeff. B | Unstd. Coeff. Std. Error | Std. Coeff. Beta | t | Sig. |
|---|---|---|---|---|---|---|
| 1 | (Constant) | .931 | .066 | | 14.189 | .000 |
| | 1.Your business competitors have implemented the Internet technology and have access to technical personnel and specialists in Web and the Internet technology | -.020 | .028 | -.057 | -.708 | .480 |
| | 2.Government policies on the e-commerce and the Master Plan – "Thailand Vision Towards a Knowledge Based Economy (IT2010)" and the related rules and regulations | -.032 | .025 | -.092 | -1.255 | .211 |
| | 3.Continual increasing availability of online access by the population in both urban and rural urban areas | -.035 | .025 | -.101 | -1.419 | .158 |
| | 4.Adoption of e-commerce technology by business partners | -.021 | .029 | -.063 | -.733 | .464 |
| | 5.Readiness of suppliers for electronic business | -.038 | .028 | -.121 | -1.333 | .184 |
| R | | .29 | | | | |
| R Square | | .084 | | | | |
| Adjusted R Square | | .061 | | | | |
| F | | 3.653 | | | | |
| Sig. | | .003 | | | | |

In Table 6, value of R Square is close to 1 at .084 when measured by the e-commerce experiences of the SMEs. It indicates that business environment factors are able to influence the ECT adoption by Thai SMEs at 8.4% with statistical significance. The test of hypothesis is in two tails. The test returned the result that the coefficients of the business environment factors have linear correlation with the e-commerce experiences. The hypothesis test showed that $H_1$ is accepted as significant value is less than 0.05 (sig.value = .003).

*$H_2$: knowledge factors influence the ECT adoption when measured by e-commerce experiences of the SMEs*

Table 7 Coefficients of Knowledge Factors influence the ECT Adoption of Thai SMEs measured by E-commerce Experiences

| Model | Knowledge Factors | Unstd. Coeff. B | Unstd. Coeff. Std. Error | Std. Coeff. Beta | t | Sig. |
|---|---|---|---|---|---|---|
| 1 | (Constant) | .478 | .154 | | 3.113 | .002 |
| | 1. Your employee has prior experience or involvement with the process of changing from traditional business to online business | .030 | .043 | .066 | .686 | .494 |

| Model | Knowledge Factors | Unstd. Coeff. | | Std. Coeff. | t | Sig. |
|---|---|---|---|---|---|---|
| | | B | Std. Error | Beta | | |
| | 2. The managers in your organization have experience with ICTs | -.036 | .057 | -.060 | -.637 | .525 |
| | 3. You are enthusiastic to adopt and experiment with new and innovative technologies | -.037 | .060 | -.079 | -.609 | .544 |
| | 4. There are models of successful use in other companies in your industry sector | -.007 | .032 | -.021 | -.225 | .822 |
| | 5. Perceived need to change and implement ECTs - Web and Internet technologies | .207 | .067 | .328 | 3.103 | .002 |
| | 6. Your company has prior experiences with new technology implementation | .028 | .057 | .053 | .501 | .617 |
| | 7. You have trust and confidence in ECTs | -.119 | .053 | -.270 | -2.230 | .027 |
| | 8. Your understanding of the available opportunities and options with ECTs | -.096 | .052 | -.207 | -1.861 | .065 |
| | 9. Your perceived value or relevance of ECTs with respect to the business | -.014 | .067 | -.027 | -.217 | .828 |
| | 10. Adequacy and variety of information resources on ECTs | .018 | .059 | .035 | .304 | .762 |
| | 11. Adequacy and variety of communication channels for the implementation of ECTs | .110 | .057 | .211 | 1.944 | .054 |
| | 12. Need for frequent communication between your firm and your trading partners | -.062 | .033 | -.184 | -1.896 | .060 |
| R | | .43 | | | | |
| R Square | | .185 | | | | |
| Adjusted R Square | | .112 | | | | |
| F | | 2.519 | | | | |
| Sig. | | .005 | | | | |

In Table 7, value of R Square is close to 1 at .185 when measured by the e-commerce experiences of the SMEs. It points that knowledge factors influence the ECT adoption by Thai SMEs at 18.5% with statistical significance. The test of hypothesis is in two tails. The tests produced coefficients of the knowledge factors, which have linear correlation with the e-commerce experiences. The hypothesis test shown that $H_2$ is accepted as significant value is less than 0.05 (sig.value = .005).

*$H_3$: Has linear correlation between organisation factors and ECT adoption when measured by e-commerce experiences of the SMEs*

Table 8 Coefficients of Organisation Factors influence the ECT Adoption of Thai SMEs Measured by E-commerce Experiences

| Model | Organisation Factors | Unstd. Coeff. | | Std. Coeff | t | Sig. |
|---|---|---|---|---|---|---|
| | | B | Std. Error | Beta | | |
| | (Constant) | .950 | .069 | | 13.851 | .000 |
| | 1.Availability of capital for starting-up e-commerce systems | -.018 | .028 | -.045 | -.621 | .535 |
| | 2.Reduction in the number of employees by implementing e-commerce systems | -.053 | .019 | -.206 | -2.814 | .005 |
| | 3.Perceived higher priority of the e-commerce project over other projects that require existing resource and time | -.026 | .030 | -.077 | -.865 | .388 |
| | 4.Management support for setting up and implementing e-commerce systems | -.037 | .033 | -.108 | -1.143 | .254 |
| | 5.Contribution by government, professional or business associations (e.g. Office of SME) in raising the awareness and facilitating the implementation of e-commerce technology | -.036 | .029 | -.097 | -1.230 | .220 |
| R | | .296 | | | | |
| R Square | | .088 | | | | |
| Adjusted R Square | | .065 | | | | |
| F | | 3.836 | | | | |
| Sig. | | .002 | | | | |

In Table 8, value of R Square is close to 1 at .088 when measured by the e-commerce experiences of the SMEs It indicates that organisation factors influence the ECT adoption by Thai SMEs at 8.8% with statistical significance. The two tail test of hypothesis produced coefficients of the organisation factors which have linear correlation with the e-commerce experiences. The hypothesis test shown that $H_3$ is accepted as the significant value is less than 0.05 (sig.value = .002).

*$H_4$: Has linear correlation between technology factors and ECT adoption when measured by e-commerce experiences of the SMEs*

Table 9 Coefficients of Technology Factors influence the ECT Adoption of Thai SMEs measured by E-commerce Experiences

| Model | Technology Factors | Unstd. Coeff. | | Std. Coeff | t | Sig. |
|---|---|---|---|---|---|---|
| | | B | Std. Error | Beta | | |
| | (Constant) | .953 | .066 | | 14.436 | .000 |
| | 1. Cost for setting-up, installing and maintaining the e-commerce systems | -.083 | .031 | -.209 | -2.640 | .009 |
| | 2. Advancement of e-commerce technology, which enables the selling of products and servicing online customers | .031 | .032 | .081 | .962 | .337 |
| | 3. Availability of Internet and E-commerce infrastructure such as wired or wireless communication, | -.022 | .031 | -.062 | -.697 | .487 |

| Model | Technology Factors | Unstd. Coeff. | | Std. Coeff | t | Sig. |
|---|---|---|---|---|---|---|
| | | B | Std. Error | Beta | | |
| | bandwidth, network service, gateway and Internet service provider | | | | | |
| | 4. Availability and adequacy of existing e-commerce technology and tools | -.056 | .031 | -.157 | -1.796 | .074 |
| | 5. Complexity and intricacy of e-commerce technology | -.040 | .019 | -.150 | -2.116 | .036 |
| R | | .356 | | | | |
| R Square | | .126 | | | | |
| Adjusted R Square | | .105 | | | | |
| F | | 5.822 | | | | |
| Sig. | | .000 | | | | |

In Table 9, the value of R Square is close to 1 at .126 when measured by the e-commerce experiences of the SMEs. It implies that technology factors influence the ECT adoption by Thai SMEs at 12.6% with statistical significance. The test of hypothesis is in two tails. The test revealed coefficients of the technology factors which have linear correlation with the e-commerce experiences. The hypothesis test shown that $H_4$ is accepted as significant value is less than 0.05 (sig.value = .000).

In summary, the four hypothesises are accepted with the statistic significant. The Figure 2 shows the comparative hypothesis test:

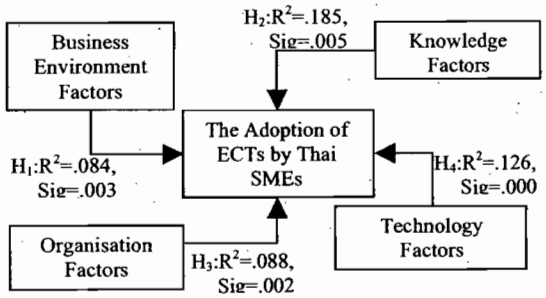


Figure 2 The Comparative Hypothesis Test

Figure 2 shows that knowledge factors have influenced the adoption of ECTs by the Thai SMEs at the highest scale as $R^2$=18.5% and sig.value=.005. Followed by the technology factors at the second highest influence ($R^2$=12.6%,sig.value=.000), organisation factors at $R^2$=8.8% and sig.value=.002), and business environment factors at R2=8.4% and sig.value=.003, in ascending order.

## 5. CONCLUSION

There are four factors influence the adoption of ECTs by the SMEs. The first factor, *business environment*, influences the adoption quite likely at the average rating 1.42. The second factor, *knowledge*, influences the adoption of ECTs at quite likely scale (1.68). The third factor, *organization*, influences the ECT adoption at the quite likely scale between average rating 1.58 and 1.83. Moreover, the fourth factor, *technology*, influences the adoption at quite likely scale 1.60. The four hypotheses are tested by regression analysis. The results show that the SMEs, which have e-commerce experiences, were influenced by the four factors with statistical significance. The test resulted coefficients of the factors have linear correlation with the e-commerce experiences.

Regarding the results, related organisations or institutions should pay intentions on how to improve the factors related to the best practices. For example; business environment factors that impact to the adoption are able to bring the SMEs to the arena of efficient competition in both domestic and international market. The Thai government should have an annually study of the business environment factors; consequently, publicize the study results to the SMEs in order to encourage and stimulate them to adopt the ECTs because of their competitors are already advancing in this important area. In term of technology factors, contribution from the government for helping the SMEs invest in the ECTs themselves is an important role. Hence, the government organisations such as SMEs, banks and related units should foster a close relationship with the SMEs in all aspects: funding, consulting, marketing, free software developing, providing sufficient e-commerce infrastructure, etc. It is believed that this will bring great benefits to the SMEs and to Thailand.

## 6. REFERENCE


[1] Thailand. National Information Technology Committee Secretariat, *Thailand Vision towards a Knowledge-Basd Economy (IT2010)*. Bangkok: NECTEC, 2002.

[2] S. Keretho and P. Limsit, "E-Commerce the Way of Business in Thailand. An International Workshop on Electronic Commerce Policy and Regional Cooperation, Bangkok 19-21 June 2002. ," *APEC Electronic Commerce Training Centre,* 2002. [Online]. Available: http://www.ecommerce.or.th/APEC-Workshop2002/ppt/pdf/ec_way_business_in_Thailand.pdf [Accessed: 12 July 2006].

[3] S. Tangkitvanitcha, *Creating Capacity for Competition of E-Commerce: Policy Recommendation (Research Report)*. Bangkok: Thailand Development Research Institute Foundation, 2000.

[4] D. Jutla, P. Bodorik, and J. Dhaliwal, "Government Support for e-Business Readiness: Metrics and Approaches from Canada, Norway, Singapore and the Netherlands," *Internet Research,* vol. 12 pp. 139-164, 2002.

[5] C. Kittikanya, "Electronic Commerce: Uptake remains relatively slow," 2001. [Online]. Available: http://www.bangkokpost.net/yereview2000/ecommerce.html [Accessed: 9 March 2006].

[6] M. Smith, "Technology and Trust," *Canadian Banker,* vol. 104, pp. 34-35, 1997.

[7] G. Lohse and P. Spiller, "Electronic Shopping," *Communications of the ACM,* vol. 41, pp. 81-88, 1998.

[8] Kasikorn Research Centre Co. Ltd., "E-Commerce: Road to Success for SMEs (Research Report)," 2004. [Online]. Available: http://www.krc.co.th. [Accessed: 9 December 2006].

[9] Thailand. ECRC (Electronic Commerce Resource Centre), "2002. e-Commerce Thailand: Statistics & Analysis (Research Report) " *NECTEC,* 2000. [Online]. Available: http://www.ecommerce.or.th/APEC-Workshop2002/ppt/pdf/P1-50.pdf [Accessed: 28 March 2006].

[10] Thailand. National Electronics and Computer Technology Centre (NECTEC), "The Internet Index of Thailand " 2006. [Online]. Available: http://www.nectec.or.th/Internet/Index.html. [Accessed: 2 June 2006].

[11] G. Lees, "Perspectives: Asia Wired," *Asia, Inc,* 2002. [Online]. Available: http://0-proquest.umi.com.prospero.murdoch.edu.au:80/pqdweb?did=975156351&sid=2&Fmt=3&clientId=20829&RQT=309&VName=PQD [Accessed: 1 March 2006].

[12] The Asia Foundation, "SMEs and E-Commerce - The Asia Foundation (Research Report)," 2002. Available:

http://www.asiafoundation.org/pdf/SMEsurvey_thailand.pdf [Accessed: 28 March 2006].

[13] S. A. Wymer and E. Regan, "Factors Influencing E-Commerce Adoption and Use by Small and Medium Businesses," *Electronic Markets,* vol. 15, pp. 438-453, 2005.

[14] E. M. Rogers, *Diffusion of Innovations*, 4th ed. New York: The Free Press, 1995.

[15] E. M. Rogers, "New Product Adoption and Diffusion," *Journal of Consumer Research,* vol. 2 pp. 290-301, 1976.

[16] F. D. Davis, "A Technology Acceptance Model for Empirically Testing New End-User Information Systems: Theory and Results," in *Sloan School of Management*: Massachusetts Institute of Technology, 1986.

[17] F. D. Davis, "Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Information Technology," *MIS Quarterly,* vol. 13, pp. 319-339, 1989.

[18] F. D. Davis, R. P. Bagozzi, and P. R. Warshaw, "User Acceptance of Computer Technology: A Comparison of Two Theoretical Models," *Management Science,* vol. 35, pp. 982-1003, 1989.

[19] K. Mathieson, "Predicting User Intentions: Comparing the Technology Acceptance Model with the Theory of Planned Behaviour," *Information Systems Research,* vol. 2, pp. 173-191, 1991.

[20] D. Straub, M. Limayem, and Karahannaevaristo, "Measuring System Usage - Implication for IS Theory Testing," *Management Science,* vol. 41, pp. 1328-1342, 1995.

[21] B. Szajna, "Emprirical Evaluation of the Revised Technology Acceptance Model," *Management Science* vol. 42, pp. 85-89, 1996.

[22] M. G. Morris and A. Dillon, "The Influence of User Perceptions on Software Utilization: Application and Evaluation of a Theoretical Model of Technology Acceptance," *IEEE Software,* vol. 14, pp. 56-75, 1997.

[23] P. J. Hu, P. Y. K. Chau, O. R. L. Sheng, and K. Y. Tam, "Examining the Technology Acceptance Model Using Physical Acceptance of Telemedicine Technology," *Journal of Management Information Systems,* vol. 16, pp. 91-112, 1999.

[24] M. Koufaris, "Applying the Technology Acceptance Model and Flow Theory to Online Consumer Behaviour," *Information Systems Research,* vol. 13, pp. 205-223, 2002.

[25] Y. Gao, "Applying the Technology Acceptance Model (TAM) to Educational Hypermedia: A Field Study," *Journal of Educational Multimedia and Hypermedia* vol. 14, pp. 237-247, 2005.

[26] M. Fishbein and I. Ajzen, *Belief Attitude, Intension and Behaviour: An Introduction to Theory and Research.* Reading, MA: Addison-Wesley, 1975.

[27] I. Ajzen and M. Fishbein, *Understanding Attitudes and Predicting Social Behaviour.* Englewood Cliffs, NJ. . Prentice-Hall, 1980.

[28] I. Ajzen, "Perceived Behavioural Control, Self-Efficacy, Locus of Control, and the Theory of Planned Behaviour," *Journal of Applied Social Psychology,* vol. 32, pp. 665-683, 2002.

[29] A. S. Notani, "Moderators of Perceived Behavioural Control's Predictiveness in the Theory of Planned Behaviour: A Meta-Analysis," *Journal of Consumer Psychology,* vol. 7, pp. 247-271, 1998.

[30] D. J. Terry, M. A. Hogg, and K. M. White, "The Theory of Planned Behaviour: Self-Identity, Social Identity and Group Norms," *Journal of Social Psychology,* vol. 38, pp. 225-244, 1999.

[31] D. Parker, A. S. R. Manstead, S. G. Strading, J. T. Reason, and J. S. Baxter, "Intentions to Commit Driving Violations: an Applcation of the Theory of Planned Behaviour," *Journal of Applied Psychology,* vol. 77, pp. 94-101, 1992.

[32] A. Bandura, *Social Learning Theory.* Englewood Cliffs, NJ: Prentice Hall, 1977.

[33] A. Bandura, "Self-Efficacy: Toward a unifying Theory of Behavioural Change," *Psychological Review,* vol. 84, pp. 191-215, 1977.

[34] A. Bandura, "The Self-System in Reciprocal determinism," *American Psychologist,* vol. 33, pp. 344-358, 1978.

[35] A. Bandura, *Social Foundations of Though and Action: A Social Cognitive Theory.* Englewood Cliffs, NJ: Prentice Hall., 1996.

[36] A. Bandura and F. J. Jourden, "Self-Regulatory Mechanisms Governing Social Comparison Effects on Complex Decision Making," *Journal of Personality and Social Psychology* vol. 60, pp. 941-951, 1991.

[37] J. W. Jones, "Personality and Epistemology: Cognitive Social Learning Theory as a Philosophy of Science," *Zygon,* vol. 24, pp. 23-38, 1989.

[38] W. Mischel, "On the Interface of Cognition and Personality," *American Psychologist,* vol. 34, pp. 740-754., 1979.

[39] J. B. Rotter, "Cognates of Personal Control: Locus of Control, Self-Efficacy, and Explanatory Style: Comment," *Applied and Preventive Psychology* vol. 1, pp. 127-129, 1992.

[40] W. R. Woodward, "The "Discovery" of Social Behaviourism and Social Learning Theory, 1870-1980," *American Psychologist,* vol. 37, pp. 396-410, 1982.

[41] J. Anderson and P. Schwager, "SME Adoption of Wireless LAN Technology: Applying the UTAUT Model," in *Proceedings of the Southern Association for Information Systems* Savannah, Georgia, 2003, pp. 39-43.

[42] V. Venkatesh, M. G. Morris, G. B. Davis, and F. D. Davis, "User Acceptance of Information Technology: Toward a Unified View," *MIS Quarterly,* vol. 27, pp. 425-478, 2003.

[43] Thailand. Office of Small and Medium Enterprises Promotion, "The Summary of Action Plan for Thai SMEs Promotion in 2002-2006," 2002. [Online]. Available: http://www.sme.go.th/file.aspx?action=download&cid=283778%20 [Accessed: 30 March 2006].

[44] T. Yamane, *Statistics: An Introductory Analysis*, 3d ed. New York: Harper and Row, 1973.