ABSTRACT

This research was carried out with three major purposes: 1) to study the effects of organization characteristics, attitudes toward technology, and external pressure from outside organizations on electronic business adoption levels among small and medium sized enterprises, 2) to study the effects of attitude toward electronic business on trust in electronic business technology, and 3) to study the influence of trust in electronic business on electronic business adoption levels among small and medium sized enterprises.

The study was based on survey research. The sample was drawn from small and medium sized enterprises listed in the auto part manufacturing, electric, and electronic industries in Thailand. The questionnaire was developed and used in the data collection process. Ordinary least squares and partial correlation analysis techniques were adopted to test the hypotheses.

The research results show that
1. Most small and medium sized enterprises adopted electronic business at the web level. On average, they had used computer technology for 9 years but had used the Internet technology for only 4 years.
2. Organization size, pressure from customers, and the trialability dimension of attitudes toward technology had positive effects on levels of electronic business adoption. The pressure from suppliers as well as the complexity dimension of attitudes toward technology had negative effects on electronic business adoption levels. In addition, the relative advantage and observability dimensions of attitudes toward technology had positive effects on trust in electronic business technology.

The implication of this research is that the small and medium sized enterprises association should provide strategic support on electronic business adoption as well as the development of customer relation management. The association should get involved in extending the organizational learning boundary in the area of supply chain management, building trusted relationships, exchanging and transferring knowledge in supply chain management as well as providing support for adopting higher levels of electronic business.
The advance of information technology has an important role in the business sectors. The goals of information technology adoption were to develop operations and services which will ultimately lead to building competitive advantage. Information technology adoption can also be regarded as a new strategy for businesses because it can help create value innovation (Kim & Mauborgne, 2005). This value innovation will help develop new products and services that customers never encounter before, create new markets, and better respond to customer needs.

Electronic business (e-business) is referred to as business transactions conducted via electronic means (Jones & Tilley, 2003; Slyke & Bélanger, 2003). These mediums include electronic mail, enterprise resource planning (ERP), e-commerce, electronic data Interchange (EDI), e-payment, as well as all other activities conducted through the Internet network.

E-business provides numerous benefits to business enterprises (Mullane, Peters & Bullington, 2001). It helps explore market opportunities (Booth, 2003). It also helps push the enterprises’ products across borders with ease as well as creating new markets through the Internet network. In addition, e-business can help reduce costs of internal and external communications (Gottschalte & Abrahamson, 2002) leading to higher profitability for the company.

The Thai small and medium sized enterprises (SMEs) have had an important role in the Thai economy since the majority of Thai businesses are SMEs. As a result, the Thai government has periodically supported the idea of e-business adoption and has urged small and medium sized enterprises to adopt e-business in their operations and management.

LITERATURE REVIEW

Roger’s diffusion of innovation theory has been widely studied by researchers, particularly in the field of information system. This theory explains the pattern of new idea adoption and rejection. It states that innovation adoption will heavily rely on five characteristics of innovation. They consist of relative advantage, compatibility, complexity, trialability, and observability (Roger, 2003). Relative advantage means that the innovation created must be better than what is currently being used. If organizations perceive the innovation to have relative advantage, they will be more likely to adopt that innovation. Compatibility is referred to the fact that the innovation must be compatible with the organizations’ values, beliefs, and cultures. A compatible innovation tends to be adopted rapidly by organizations.

Innovation complexity deals with the difficulty of using the innovation. If this is the case, that innovation will be rejected by organizations. Next, trialability of innovation is concerned with an opportunity to try the products before making the adoption decision. If consumers have an opportunity to try the product and are satisfied with the product, then consumers will be more likely to adopt that product. The last characteristic of innovation is observability. Organizations are likely to adopt the innovation by merely seeing other organizations adopt and use that innovation.

Personal learning in Kirton’s adaptor-innovator inventory (Kirton, 1976) can be categorized into two groups: adaptors who adopt and implement conformant rules and innovators who take risks and find a new way to resolve problems. The differences between the two groups are problem solving methods, policies, and creativity. This concept is in line with the diffusion of innovation theory which states that personal characteristics have an effect on diffusion speed. Therefore, the relevant hypothesis associated with CEOs’ personal characteristics can be derived as follows:

H1: CEOs with higher degrees of innovator characteristics will adopt higher levels of e-business application.

The size of organizations was expected to influence e-business adoption. Zhu, Kraemer, and Xu (2003) found that larger SMEs had higher intentions to adopt e-business than smaller enterprises. In addition, the agency theory indicates a relationship between organization size and the need to control. When organizations expand, they will decentralize authorities. Thus, information technology will be used to help control and support the organization operations and management. This leads to the following hypothesis:
H2: SMEs with greater organization size will adopt higher levels of e-business application.

Organizational learning has an impact on innovation adoption. Organizations who have acquired knowledge through learning will exchange knowledge with members of their organizations (Chaston, Badger & Sadler-Smith, 2001), decentralize decision making, and be more flexible to change (Caloghirou, Protoperou, Spanos, & Papagiannakis, 2004). Organizational learning also has an effect on new technology acceptance (Klempa, 1994). Moreover, organizations that generate new ideas or innovations usually have double-loop learning (Argyris & Schön, 1978). Thus, SMEs’ organizational learning is likely to affect e-business adoption levels. The following hypothesis is then derived.

H3: SMEs with higher degrees of learning will adopt higher levels of e-business application.

CEOs’ knowledge of e-business was found to affect e-business adoption (Zhu et al., 2003). Additionally, CEOs’ information technology knowledge had a critical role in SMEs’ information technology adoption (Fink, 1998) as well as using application programs (Thong & Yap, 1995). CEOs’ support is a critical factor influencing the success of SMEs’ ERP implementation (Petroni, 2002) and the application of communication technology (Premkumar & Roberts, 1999).

Employees’ technology skills were also found to affect e-business adoption (Zhu et al., 2003). These skills tend to influence adoption speed since employees with these skills are likely to learn faster. Research also showed that skills and knowledge had an impact on the success of innovation adoption (West, 1992). Moreover, monetary support for e-business adoption was also a key factor influencing information technology adoption (Fink, 1998), especially SMEs with limited resources (Buratti & Penco, 2001). Hence, the following hypothesis is developed.

H4: SMEs with higher degrees of organization readiness will adopt higher levels of e-business application.

External pressure outside organizations may also influence electronic data interchange, enterprise resource planning, information technology adoption, and the use of the Internet. External pressure may come from competition, customers, and suppliers. Hence, the following hypotheses were derived.

H5: SMEs with higher degrees of competitive pressure will adopt higher levels of e-business application.

H6: SMEs with higher degrees of pressure from suppliers to coordinate and share information will adopt higher levels of e-business application.

H7: SMEs with higher degrees of pressure from customers to provide the Internet as a communication medium will adopt higher levels of e-business application.

Innovation characteristics associated with relative advantage (Premkumar & Roberts, 1999), compatibility (Agarwal & Prasad, 1998; Premkumar & Roberts, 1999), complexity (Premkumar & Roberts, 1999), trialability (Sadowski, Maitland & Dongen, 2002), and observability (Teo, Wei & Benbasat, 2003) were also found to affect innovation adoption decisions concerning information technology. In this light, the following hypotheses were proposed.

H8: SMEs who perceive e-business to have higher degrees of relative advantage will adopt higher levels of e-business application.
H9: SMEs who perceive e-business to have higher degrees of compatibility with their work, existing values, and beliefs will adopt higher levels of e-business application.

H10: SMEs who perceive e-business to have higher degrees of complexity will adopt lower levels of e-business application.

H11: SMEs who have tried and used e-business technology will adopt higher level of e-business application.

H12: SMEs who have observed and realized the beneficial results of e-business adoption will adopt higher levels of e-business application.

Information technology adoption was shown to be related to trust. Users who trust information technology were likely to believe in the benefits of applying technology to their work. Trust on e-business technology may influence users to utilize the Internet network (Tan & Walter, 2000), rely on the system (Bargh, Janssen & Smit, 2002), have confidence (Croom, 2000), and use e-business with ease (i.e., no risk involved) (Friedman, Kahn & Howe, 2000; Yousafzai, Pallister & Foxall, 2003). Trust in technology tends to influence information technology adoption in organizations (Bassellier, Reich & Benbasat, 2001). As a result, the following hypothesis was developed.

H13: SMEs with higher degrees of trust in e-business technology will adopt higher levels of e-business application.

Moreover, CEOs’ attitudes toward innovation characteristics are expected to have an influence on trust given to e-business technology, leading to the development of hypotheses listed below.

H14: The higher degrees of perceived relative advantage associated with e-business technology, the higher levels of trust in e-business technology.

H15: The higher degrees of perceived e-business technology compatibility with work, existing values, and beliefs, the higher levels of trust in e-business technology.

H16: The higher degrees of perceived complexity associated with e-business technology, the lower levels of trust in e-business technology.

H17: The higher degrees of trialability associated with e-business technology, the higher levels of trust in e-business technology.
H18: The higher degrees of observability associated with e-business adoption, the higher levels of trust in e-business technology.

The proposed conceptual framework was developed using multiple concepts/theories. These include diffusion of innovation (Roger, 2003), organizational learning (Argyris & Schön, 1978), trust (Mayer et al., 1995; McKnight & Chervany, 2001; Slyke & Be’langer, 2003), and adoptor-innovator inventory (Kirton, 1976).

The e-business adoption level was adapted from the U.K. department of trade and industry (Department of trade and industry, 2000) as well as the study conducted by Teo and Pian (2004) Martin and Matlay (2001). Both sources classified e-business adoption into five levels ranging from basic application to advanced application. These five levels consist of e-mail, web presence, e-commerce, e-business, and transformed organizations. In light of this, this research used a semantic differential scale to represent the six levels of e-business adoption. Numbers 0 - 5 were used where 0 means never use and 5 means using a great deal. The six point semantic differential scale is analogous to the scale used by Teo and Pian (2004) where 0 means never use, 1 means using only basic e-mail, 2 means using e-mail and having websites, 3 means using e-mail, having websites, and conducting e-commerce, 4 means using e-mail, having websites, conducting e-commerce, as well as e-business, and 5 means using everything stated in 4 plus moving toward transformed organizations using the Internet network. The proposed conceptual framework is presented in Figure 1.

RESEARCH METHODOLOGY

The population of this study was SMEs listed in the auto part manufacturing, electric, and electronic industries in Thailand. The total sample size was 975 firms.

Questionnaires were developed and used in this study. Five scholars were asked to evaluate the first draft of the questionnaire. Modification was carried out and the second draft of the questionnaire was used in the pretest. Thirty small and medium sized enterprises were randomly selected to pretest the questionnaire.

In the pretest, five-point Likert scale (from strongly disagree to strongly agree) was utilized to measure constructs concerning CEO’s innovativeness, organizational learning, organization readiness, competitive pressure, pressure from customers, pressure from suppliers, the five dimensions of innovation characteristics, and trust. Organization size was measured using the number of full time employees. E-business adoption level was measured using a six point semantic differential scale (0 means never use to use a great deal).

1. Organization characteristic
   - Innovator (+)
   - Size (+)
   - Organizational learning (+)
   - Organization readiness (+)

2. External pressure
   - Competition pressure (+)
Factor analysis using principal component and varimax rotation was carried out to examine whether indicators intended to measure the same construct actually measured the same thing. All constructs were examined using factor analysis. The results suggest no problem with the measures. Then, Cronbach alphas were used to investigate the reliability of all the constructs. The results indicated that all Cronbach alphas were at least 0.7, suggesting the reliability of all constructs (Nunnally, 1978).

Data Collection
The final version of questionnaires were mailed to top executives, namely the managing directors or the CEOs of the companies, of all 975 firms. Respondents were asked to fill out the questionnaire and return it in a reply envelope. Two hundred and twenty seven completed questionnaires were received, generating a response rate of 21.23%.

Confirmatory factor analysis using LISREL 8.53 was used to check construct validity (Jöreskog & Sörbom, 1996). All lambdas of indicators were highly significant. All t-values were well above 1.96 (p<0.05). As a result, all constructs with multiple items appeared to have convergence in measurement (Bagozzi 1981).

Then, the composite reliability of individual constructs were computed. All indexes were acceptable. They were above 0.6 (Bagozzi & Yi, 1988, pp. 74-94; Straub, 1989, pp. 147-169).

A 95% confidence interval of the correlation for each pair of constructs was computed. The computation was based on plus or minus 1.96 standard-errors around each correlation. The lower bound and the upper bound were then obtained. The results showed that none of the confidence intervals included or were very close to 1.0. This suggested the presence of discriminant validity among constructs (Anderson, 1987; Panayides & So, 2005).

A comparison was made between early and late responses. A two sample t-test was conducted to test the differences between early and late responses in terms of the number of employees, the period of Internet use, and the period of computer use. The results showed no differences between early and late responses (p > 0.10). Hence, nonresponse bias was not an issue in this research. (Hair et al, 1998)

Unacceptable levels of collinearity are not evidenced in any of the constructs based on the conventional cut-off values of tolerance (T > 0.1) (Foxall & Vani-de-Soriano, 2005). In addition, all variance inflation factors were way below the cut-off point (VIF < 10) (Belsley, 1991; Netter, Wasserman & Kutner, 1985).

RESULTS
Multiple regression analysis using ordinary least squares was used to test the proposed hypotheses. The results are presented in Table 1.

| INNOVATOR | 0.015 | -0.210 | 0.834 |
| SIZE | 0.233 | 3.598 | 0.000*** |
| ORGANIZATIONAL LEARNING | 0.016 | 0.200 | 0.842 |
| ORGANIZATION READINESS | 0.232 | 2.472 | 0.014* |
| TRUST | -0.077 | -0.922 | 0.358 |
| REALATIVE ADVANTAGE | -0.040 | -0.456 | 0.649 |
| COMPATIBILITY | 0.034 | 0.351 | 0.726 |
| COMPLEXITY | -0.167 | -2.591 | 0.010** |
| TRIALABILITY | 0.232 | 2.563 | 0.011* |
| OBSERVEABILITY | -0.097 | -1.180 | 0.240 |
| COMPETITION PRESSURE | -0.002 | -0.016 | 0.987 |
| SUPPLIER PRESSURE | -0.291 | -3.390 | 0.001** |
| CUSTOMER PRESSURE | 0.298 | 3.412 | 0.001** |

N=183 R²=.356 F=7.181 sig=0.000
*** sig. 0.001
** sig 0.01
* sig 0.05
The results showed that five exogenous constructs had significant effects on e-business adoption levels. The direction of the effects was consistent with what was expected. These exogenous constructs consist of pressure from customers (p < 0.001), organization size (p < 0.001), organization readiness (p < 0.05), trialability (p < 0.05), and complexity (p < 0.5). Hence, hypotheses 2, 4, 7, 10, and 11 were supported. Even though pressure from suppliers had a significant effect on e-business adoption levels, the effect was in the opposite direction from what was expected (p < 0.01). Thus, this hypothesis was not supported.

Table 2 provides results of hypothesis testing concerning the dimensions of innovation characteristics and trust. Partial correlation analysis was adopted to test the hypotheses.

Table 2. Partial correlation analysis results

<table>
<thead>
<tr>
<th></th>
<th>Partial correlation</th>
<th>t-value</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>REALATIVE ADVANTAGE</td>
<td>0.437</td>
<td>6.456</td>
<td>0.000***</td>
</tr>
<tr>
<td>COMPATIBILITY</td>
<td>0.002</td>
<td>0.026</td>
<td>0.979</td>
</tr>
<tr>
<td>COMPLEXITY</td>
<td>-0.086</td>
<td>-1.146</td>
<td>0.253</td>
</tr>
<tr>
<td>TRIALABILITY</td>
<td>0.100</td>
<td>1.337</td>
<td>0.183</td>
</tr>
<tr>
<td>OBSERVEABILITY</td>
<td>0.185</td>
<td>2.505</td>
<td>0.013*</td>
</tr>
</tbody>
</table>

N=183 R=.356 F=19.502 sig=0.000  
*** sig 0.001  
** sig 0.01  
* sig 0.05

The results demonstrated that two innovation characteristics were related to trust in e-business technology and in the expected direction. These were relative advantage (p < 0.001) and observability (p<0.05). Hence, hypotheses 14 and 18 were supported but hypotheses 15, 16, and 17 were not supported.

DISCUSSION AND IMPLICATION

The research results are useful and lead to the following implications.
1) SME association should encourage Thai entrepreneurs to adopt e-business application in a strategic manner since it will ultimately lead to the building of SMEs’ competitive advantage in the market.
2) Customer relation management can be developed via the use of Internet network. Retaining existing customers is a must for the SMEs.
3) The boundary of organizational learning can be expanded to achieve lower costs, especially in the area of supply chain management.
4) Long-term relationships are important to the survival of SMEs; hence, SMEs should try to build trust and commitment in the area of supply chain management.
5) The government should get more involved in providing support on e-business application to Thai SMEs since Thai SMEs play a major role in contributing to the Thai economy.

CONCLUSION

Our research objectives were to study the model of strategic elements affecting e-business adoption levels. The research results showed that pressure from customers, pressure from suppliers, organization size, organization readiness, trialability, and complexity had a significant influence on the e-business adoption levels. While CEOs’ innovativeness, organizational learning, competitive pressure, trust in e-business technology, relative advantage, compatibility, observability were not significant.

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REFERENCES


Ms. Chattawan Saenbudda is currently an instructor of business computer program, faculty of management science, Rajabhatmasarakham University. She received her Ph.D. in business administration from Ramkhamhaeng University (2007), an MBA degree from Khonkhan University (1997), a bachelor’s degree in nursing from Saraburee Nursing College (1990), a bachelor’s degree in laws from Sukhothaitammatirat University (1995), and a bachelor’s degree in business information technology from Sukhothaitammatirat University (2004).