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Table of Contents

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E-Commerce Adoption in Thailand: An Empirical Study of Small and Medium Enterprises (SMEs)

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ABSTRACT

Thailand, one of the fast growing countries in Asia, has initiated and implemented a series of national plans and activities to promote e-commerce adoption in both public and private sectors. Despite such efforts, e-commerce adoption rate is still slow. It is therefore important to understand factors affecting a firm's decision on e-commerce adoption in Thailand. This study examines the factors influencing e-commerce adoption decisions in small and medium enterprises (SMEs) in Thailand. We classify firms into three main groups based on the earliness of e-commerce adoption, namely adopters, prospectors, and laggards. Three groups of factors influencing adoption decisions are identified, including organizational, technology, and environmental factors. Data was collected through a national survey in Thailand. The statistical analysis results strongly support the hypotheses. The results are interpreted and the implications of this study are subsequently discussed.

KEYWORDS

Electronic Commerce, Small and Medium Enterprises, Technology Adoption, Empirical Study

INTRODUCTION

Currently, e-commerce, "the sharing of business information, maintaining business relationships, and conducting business transactions by means of telecommunication network" (Zwass, 1996), pervasively and dramatically affects the way firms think, operate, and compete in the market. It was predicted that e-commerce would generate the worldwide revenue as high as 6.9 trillion dollar in 2004, and the number of Internet users would grow as high as 765 million users in 2005 (CommerceNet, 2003). About forty percent of the online spending is originated in the United States; however, this proportion is predicted to reduce to about 38 percent by 2006 as increasing online spending of residents in Asia and Western Europe (Virgoroso, 2002). In addition, it is also expected that the online buying in Asia will grow about 89 percent in 2002 (Virgoroso, 2002), and the Asia Pacific will be the second most profitable with a value of 1.6 trillion dollar (CommerceNet, 2003).

Likes many other Asian countries, Thailand, one of the fast growing countries in Asia, has initiated and implemented a series of national plans and activities to promote diffusion of e-commerce in both public and private sectors. Despite optimism towards e-commerce, e-commerce adoption rate is still slow. According to the 2002 e-readiness survey by the Economist Intelligence Unit (EIU), Thailand was ranked 46 from the 60 main economies of the world (EIU, 2002). It is therefore important to understand factors affecting a firm's decision on e-commerce adoption. A deeper and clearer understanding on such issues would help design appropriate e-commerce models to target consumers in these economies and also to formulate appropriate policies to accelerate e-commerce diffusion in other countries.

The main objective of this paper is to examine the determinants of e-commerce adoption decisions in small and medium enterprises (SMEs) in Thailand. Prior studies found that small organizations are slow in adopting technological innovations (Yap, Thong, & Raman, 1994). Since SMEs constitute almost 90 percents of all businesses in many economies, the slowing rate of innovation adoption is a critical issue needed to be examined. Moreover, SMEs are different from large businesses in many aspects. Organizational theories that are applicable to large businesses may not fit in small and medium business environment (Wesh & White, 1981). There is a need to examine whether models of IT innovation tested in the large organization context can be similarly applied to small and medium businesses environment.

In this study, we classify firms into three main groups based on the extent of e-commerce innovativeness (Roger, 1983), the extent to which an organization is relatively earlier to adopt e-commerce than others, namely *adopters*, *prospectors*, and *laggards*. First, adopters are firms that have already implemented and used e-commerce in their business activities. These firms are creative and innovative in applying leading edge technologies, such as e-commerce, compared with their competitors. Second, prospectors are firms that have not yet implemented e-commerce, but they have a specific plan in the near future to adopt and implement e-commerce. Prospectors tend to avoid the immediate application of leading-edge technologies; however, after a certain period of time, they are readily to adopt innovations that have been proven effective. Finally, laggards are firms that have not implemented e-commerce, and have no plan and intention to adopt e-commerce in the near future. Laggards typically are slow in adopting new innovation; however, they may decide to adopt the technologies when forcing by business competition.

Prior studies in the organization innovation, information technology use, and diffusion of information technology innovation suggest a set of variables that can be used as predictors of e-commerce adoption (Kimberly & Evanisko, 1981; Kwon & Zmud, 1987; Tornatzky & Fleischer, 1990). Based on the review of the literatures, particularly the study by Tornatzky and Fleischer (1990), we identify three sets of predictors for e-commerce adoption: *organizational factors, technology factors*, and *environmental factors*. Since this study focuses on e-commerce adoption at an organizational level, individual characteristic variables, such as individual innovation's perceptions, are not considered in this study. The sample frame includes

small and medium businesses located in Thailand—an Asia based country. Most of the IT innovation studies have been conducted in the US. However, Asian firms are different from US firms in many respects, such as geographic, political, and cultural aspects. The research findings from this study can help in determining whether the organizational innovation theory can be generalized across other settings, particularly in Asian settings. In addition, newly industrialized and developing countries have been initiated government interventions to accelerate the use of IT within their countries. Some researchers (Thong, 1999) suggested that the role of institutions such as governments must be considered as essential components in IT innovation adoption. The key factors found to be crucial from this study could be incorporated in governmental initiatives and could be used in developing a strategy for promoting e-commerce adoption among small and medium businesses in the region.

The outline of this chapter is as following. First, E-commerce status in Thailand, and the theoretical background are discussed. Next, the hypothesis development, methodology, and the results of data analysis are explained. The final section discusses the implications of this study for research and practice.

BACKGROUND

E-commerce in Thailand

Thailand has initiated and implemented a series of national plans and activities to promote diffusion of e-commerce in both public and private sectors. Several governmental agencies have engaged in these activities. For example, the National Electronics and Computer Technology Center (NECTEC), the governmental agent responsible for the development of Information Technology in Thailand, has initiated various projects and activities promoting the use of e-commerce in Thailand, such as developing the electronic commerce framework for Thailand, drafting IT laws facilitating the diffusion of e-commerce, and drafting technical specifications and recommendations and becoming a resource center to run awareness, information center and human resource development programs on e-commerce (NECTEC, 2002). In January 1999, the cabinet approved a proposal by the Ministry of Science, Technology and Environment to set up the Electronic Commerce Resource Center (ECRC) to ensure the smooth development of e-commerce in Thailand through awareness, training program and information center (ECRC, 2002). The Ministry of Commerce is also another key government agent that has initiated several projects to promote e-commerce particularly for importers and exporters in Thailand. Such initiatives include ThaiEcommerce.net and exporter.org, a resource center for Thai exporters. Several units under the Ministry of Commerce are also a key driver of e-commerce development in Thailand, such as Department of Export Promotion. In the context of SMEs, the Ministry of Industry is in a leading role in promoting the use of e-commerce for competitiveness. The Ministry also arranges free homepage with URL, email and provides seminars and training programs for SMEs.

According to an e-Commerce web-site survey conducted by e-Commerce Resource center, during the mid of year 2001, there were 12% of about 6,000 e-Commerce web sites (both .com and .co.th Thai companies) that offer full-scaled e-Commerce services, such as on-line catalog, electronic order and logistic services (ECRC, 2002).

Theoretical Background

Organizational innovation was adopted as a theoretical foundation for developing the research model. Organizational innovation can be defined as the development and implementation of ideas, systems, products or technologies that are new to the organization adopting it (Rogers, 1995). Innovations are means of changing an organization, either as a response to changes in the external environment or as a preemptive action to influence the environment. The adoption of innovation is a process that includes the generation, development, and implementation of new ideas or behaviors (Rogers, 1995). Innovations can be categorized by a broad range of types, including new products or services, new process technologies, new organizational structures or administrative systems, or new plans or programming pertaining to organizational members (Poutsma, Van Uxem, & Walravens, 1987). Adoption of e-commerce, hence, can be regarded as one form of innovation adoption.

The innovation literature has identified various groups of variables that are possible determinants of organizational adoption of an innovation (Fichman & Kemerer, 1997; Kimberly & Evanisko, 1981; Tornatzky & Fleischer, 1990). Based on a synthesis of the organizational innovation literature, Kwon and Zmud (1987) identified five sets of factors that may influence IT innovation. These sets include user characteristics, task characteristics, innovation characteristics, organizational characteristics, and environmental characteristics. Kimberly and Evannisko (1981) proposed three clusters of predictors for innovation adoption: characteristics of organization, characteristics of leader, and characteristics of environment.

Recently a number of IT innovation studies (e.g., Boynton, et al., 1994; Tornatzky & Fleischer, 1990) have adopted an emerging theory from the strategic management literature—absorptive capacity (Cohen & Levinthal, 1990)—to explain a firm's abilities in adopting and assimilating an innovation. Boynton, et al. (1994), for example, argued that a firm's abilities to effectively use IT are influenced by the development of an IT-related knowledge and processes that bind them together the firm's IT managers and business managers. They pointed to the organizational climate as the key factors influencing the ability of firms to absorb new knowledge and technology. Fichman and Kemerer (1997) found that organizations are more likely to initiate and sustain the assimilation of software process innovations when they have a more extensive existing knowledge in areas related to the focal innovation.

Drawing from these studies, we develop a research model for e-commerce adoption. It consists of six variables representing three major groups: organizational factors, technology factors, and external factors. First, organizational factors have been the most widely used and tested as the key determinants of innovation (Grover & Goslar,

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1993; Thong, 1999). In this study, we focus on three sets of variables: structural variable (size), process variable (top management support for e-commerce), and IT context variables (existence of IT department). Many studies have examined the effects of structural factors on innovation, such as size, specialization, and formalization (Grover & Goslar, 1993). Size is one of the most widely investigated variables for innovation adoption. The arguments for the impacts of size on organizational innovation are mixed. Some argued that larger sizes promote innovation due to greater slack resources; while, some argued that smaller sizes foster innovation due to the flexibility advantage (Utterback, 1974).

Process factors have also frequently been adopted as a key determinant of IT related innovation adoption, especially roles of top management. The IT innovation literature generally reported a positive effect of senior management support on IT related innovation (Orlikowski, 1993; Rai & Patnayakuni, 1996). The common rationales provided include influencing the allocation of slack resources and generating enthusiasm and commitment toward changes among organizational members. This study examines the positive effect of top management support in the context of e-commerce innovation.

Finally, since e-commerce is largely a bundle of various IT components (i.e., hardware, software, networking), IT context factors could play an important role in determining e-commerce adoption. Evidence from the innovation literature recently suggests that the role of a firm's ability to absorb new knowledge related to innovation can play an important role in innovation adoption (Cohen & Lavinthal, 1990). SMEs that are familiar with IT skills and knowledge might find it easier to acquire additional knowledge necessary for adopting e-commerce. The IT department is a major source of IT skills and knowledge in organizations, and could be a main unit in acquiring and assimilating the knowledge necessary to adopt and implement e-commerce innovation. Hence, it is conceivable that the existence of IT department in SMEs could promote e-commerce adoption.

The second group of variables is technology factors. Specific factors related to innovation characteristics are frequently used as a key determinant of innovation adoption intention. Rogers (1995), for example, identified several attributes of an innovation that can influence innovation acceptance behaviors, such as relative advantage, complexity, compatibility, and observability. Tornatzky and Klein (1982) identified relative advantage, compatibility, and complexity as innovation characteristics that are salient to the attitude formation of innovation adoption. Though most of these factors are more pertinent to an individual perception, some attributes are applicable at an organization level (e.g., Chau & Tam, 1997; Thong, 1999). This study investigates the effects of two innovation characteristics: perceived compatibility and perceived benefits. Different organizations may face different innovation opportunities. Whether these opportunities can be exploited depends on the degree of match between the innovation's characteristics and the infrastructure currently available in the organization (Rogers, 1995). In addition, not all innovations

are relevant to an organization. The degree of relevance depends on the potential benefits organizations received.

The third group of research variables is an external factor. Past studies have stressed the importance of environments. Environmental contingencies such as environmental uncertainty and heterogeneity have been found to be facilitators of innovation (Grover & Goslar, 1993; Schroeder & Benbasat, 1975). When organizations face a complex and rapidly changing environment, innovation is both necessary and justified (Pfeffer & Leblebici, 1977). Environmental factors, especially market factors (i.e., competitiveness), cannot be controlled by organizations; rather, they affect the way firms conduct their businesses. Thus, it is conceivable that environmental factors create a need for firms to adopt IT related innovation such as e-commerce. This study examines the effect of competitiveness on e-commerce adoption.

Table 1 summarizes the research variables used in this study. The variables included in the research model do not claim to be comprehensiveness. Rather, they are selected based on the consensus in the innovation literature and empirical evidences as representing key theoretical factors affecting organizational innovation adoption. These variables reflect three elements, organizational, technological and environmental elements, that influence the process by which innovations are adopted suggested by Tornatzky and Fleischer (1990).

Table 1. Examined Variables

Factors	Theoretical Representation	Variables
Organizational Factors	Organizational Structure	Size
	Organizational Process	Top Management Support for E-commerce
	IT Context	Existence of IT Department
Technology Factors	Technological Context	Perceived Benefits
		Perceived Compatibility
Environmental Factors	Organizational Environment	Competitiveness

HYPOTHESES

Organizational Factors

Size

Organizational size has been one of the most frequently examined factors in the study of organizational innovation (e.g., Rai & Patnayakuni, 1996; Thong, 1999). Prior studies reported that size has a positive impact on the likelihood of IS related innovation adoption such as adoption of CASE tools (Rai & patnayakuni, 1996), object oriented (Fichman & Kemerer, 1997), and TQM (Ravichandran, 2000). Large size firms are more likely to adopt innovation since they are capable of absorbing the

risk associated with innovation and have sufficient resources and infrastructure to facilitate the implementation of innovation (Fichman & Kemerer, 1997).

SMEs encounter barriers to innovation adoption by limited financial resources, insufficient technological expertise, and shortage of management perspective (Wesh & White, 1981). Adoption and implementation of e-commerce demand a certain level of organizational resources. Larger organizations should be in a better position to support such demands. Moreover, larger organizations should have a higher potential to use e-commerce due to a larger scale of business operations (Lind, et al., 1989). Therefore, we expect that e-commerce adopters would have a larger size than prospectors and laggards.

Hypothesis 1: The three types of organizations significantly differ in their size.

Top Management Support for E-commerce

It is well accepted that top management plays a critical role in acquisition and diffusion of innovation (Orlikowski, 1993; Rai & Patnayakuni, 1996; Wesh & White, 1981). Top management can stimulate change by communicating and reinforcing values through an articulated vision for the organization (Thong, 1999). Moreover, top management can ensure that resources and capabilities required for adopting and implementing innovation will be readily available when they are needed (Rai & Patnayakuni, 1996). Empirical studies in IT innovation suggested a positive effect of leadership support on innovation adoption. Rai and Patnayakuni (1996), for example, found that top management support has a positive effect on CASE tools adoption behavior in IS departments.

Adopting and implementing e-commerce requires resources extensively that are forthcoming only with the active support from top management. In addition, top management support for e-commerce would also send a strong signal to get line management to actively participate in proposing and developing e-commerce initiative. Therefore, we expect that e-commerce adopters would have a higher level of top management support for e-commerce than prospectors and laggards.

Hypothesis 2: The three types of organizations significantly differ in the extent of top management support for e-commerce.

Existence of IT Department

Absorptive capacity theory (Cohen & Levinthal, 1990) asserts that a firm's ability to appreciate an innovation, to assimilate it, and apply it to new ends is largely a result of the firm's preexisting knowledge in areas related to the focal innovation. This prior related knowledge makes it easier for organizations to acquire and retain new knowledge for innovation adoption. Complementary to this perspective, it was found that the technology assimilation is best characterized as a process of organizational learning, wherein individuals and the organization as a whole acquire the knowledge and skills necessary to effectively acquire and apply the new technology (Boynton, et

al., 1994). Prior empirical studies in IT innovation also point to prior knowledge as a key determinant of IT innovation adoption (Fichman & Kemerer, 1997).

Adopting and implementing e-commerce innovation requires organizations to posses a bundle of IT related skills and knowledge (Turban, et al., 2002) such as telecommunication knowledge (i.e., TCP/IP, HTTP protocol), security management knowledge (i.e., SSL, Public Key Infrastructure), and Internet application environment (i.e., HTML coding, Java technology). Though many small firms may adopt an outsourcing strategy for e-commerce operation, they still need some basic knowledge for selecting appropriated service providers, and, in many cases, they need these IT skills and knowledge to control and monitor the operation of e-commerce.

The IT department can be viewed as a source of IT related skills and knowledge within organizations. Most small businesses do not have any formal, or even informal IT department, and routine IT services is usually performed by its accounting or administrative departments. Small businesses which have an IT department should be in a better position to acquire some IT related skills and knowledge, which make it easier for them to acquire new knowledge for adopting e-commerce. Therefore, we expect that e-commerce adopters are more likely to have a formal IT department within organizations than prospectors and laggards.

Hypothesis 3: The three types of organizations significantly differ in the existence of IT department.

Technology Factors

Perceived Benefits

Perceived benefits refer to the extent of management recognition of the relative advantage that e-commerce can provide to the firms. Perceived benefits are regarded as an important factor in determining adoption of new innovations (Iacovou, et al., 1995; Rogers, 1995). For example, Iacovou, et al. (1995) found that perceived benefits have a positive effect on the likelihood of EDI adoption in small businesses.

The higher the level of management understanding on the relative advantage of the e-commerce, the more the likelihood of the allocation of the managerial, financial, and technological resources necessary to adopt and implement e-commerce. This positive perception of the benefits of e-commerce should provide an incentive for SMEs to adopt the innovation. Therefore, we expect that adopters of e-commerce would have a higher level of perceived benefits than those of prospectors and laggards.

Hypothesis 4: The three types of organizations significantly differ in the extent of perceived benefits.

Perceived Compatibility

Perceived compatibility is defined as the extent to which an innovation is perceived as being consistent with the existing needs, values, and technological infrastructure of

potential adopters (Rogers, 1995). Adopting e-commerce entails with the selection and implementation of a suite of technologies (i.e., hardware, software, communication networking). If the innovation is compatible with existing work practices, environments, and firms' objectives, firms will be more likely to adopt them. Therefore, we expect that adopters of e-commerce would have a higher level of perceived compatibility than that of prospectors and laggards.

Hypothesis 5: The three types of organizations significantly differ in the extent of perceived compatibility.

Environmental Factors

Industry Competitiveness

The innovation literature has widely recognizes the influences of environmental contingencies. The environment creates contingencies to which firms have to respond typically through product and process of innovation (Duncan, 1972). Moreover, firms have to be compatible with their environment, which is essential for their long-term survival and growth (Thompson, 1967).

Competitiveness reflects the intensity level of competition environment within the industry where the firms operate. In a competitive environment, businesses are pushed to be innovative by the rivalry (Pfeffer & Leblebici, 1977). Firms respond to competition by offering innovative services and products. Past studies in IT innovation suggest that, in competitive environment, firms are in a greater need to adopt IT related innovation for competitive advantage (Grover & Goslar, 1993; Ravichandran, 2000; Thong, 1999). For example, Iacovou, et al. (1995) found a strong relationship between external pressure and EDI adoption behavior. Therefore, firms in a high competitive environment are pressured to adopt e-commerce to respond to competition. E-commerce can be used a strategic tool to implement an organization's chosen strategy and to respond to competitors. Therefore, we expect that e-commerce adopters would face a higher level of competitiveness than prospectors and laggards.

Hypothesis 6: The three types of organizations significantly differ in the extent of competitiveness.

RESEARCH METHODOLOGY

Data Collection

Survey was the primary research methodology of this study. Prior the full-scale data collection phase, questionnaires were sent to two experts in the area of SMEs management, and to sixty reviewers that attended a business seminar organized by Thammasat University. Reviewers were requested to examine the document for question clarity, interest, and mechanical considerations, as well as the length of time necessary to complete the questionnaire.

The target firms for this study are Small and Medium Enterprises (SMEs) in Thailand. Based on the definition accepted by Ministry of Industrial in Thailand (Table 2), SMEs are defined as those which have overall asset values less than or equal to 200 million baht for manufacturing and service firms, 100 million baht for wholesalers, and 60 million baht for retailers. While not officially being defined, the size of SMEs, reflected by the number of employees, has mutually been accepted to be fewer than 200 (Sevilla and Soonthornthada, 2000). We adopt this number as the maximum size of SMEs.

Table 2. Definition of Small and Medium Enterprises in Thailand (Total Assets Value in Million Baht)

Sector	Medium	Small
Production†	Not more than 200	Not more than 50
Service Sector	Not more than 200	Not more than 50
Trading Sector—Wholesale	Not more than 100	Not more than 50
Trading Sector—Retail	Not more than 60	Not more than 30

† e.g., agricultural processing, manufacturing, and mining

Data for testing the hypotheses was collected through a national survey in several major provinces in Thailand, including Chiang-Mai (a northern province), Songkla (a southern province), Khon-Kaen (a north-eastern province), and Bangkok (the capital city). Respondents were those who influenced or were part of a decision making process of e-commerce adoption. Data was collected through several approaches, such as a direct mail-based survey, questionnaire distribution during Small and Medium Enterprises (SMEs) seminars, and individual interviews. Totally, one thousand and two hundred packages of questionnaire were distributed, and four hundred and fifty two questionnaires were returned. Sixty-six questionnaires were unusable. The total response rate of this study is 32.16 percent, which is very high comparing to the typical response rate of survey studies in the North America. Table 3 presents the response rate of this study. From the total 386 responses, one hundred and eight responses (27.97%) were manufacturers, one hundred and eleven responses (28.75%) were firms in service industry, ninety-two responses (23.8%) were retailers, and seventy-five responses (23.4%) were wholesalers. Table 4 presents the profile of responses by industry.

Table 3. Response Rate

Provinces	Number of Questionnaires				Response Rate
	Sent	Received	Discarded	Total	
Bangkok (Capital)	500	210	35	175	35.0%
Outside Bangkok	700	242	31	211	30.14%
Total	*1200*	*452*	*66*	*386*	*32.16%*

Table 4. Responses by industry

Industry	Number	Percentage
Manufacturers	108	27.97
Services	111	28.75
Trading Sector—Retailers	92	23.8
Trading Sector—Wholesalers	75	19.4
Total	*386*	*100*

Organization Types

Respondent firms were subsequently classified based on their e-commerce adoption action. Questionnaire asked respondents whether organizations had already adopted e-commerce. If respondents answered no, they had to specify the plan of e-commerce adoption, ranging from adoption within 3 months, 6 months, 1 year, no specific plan, or no intention of adoption. Firms were classified as *adopters* if they had already adopted e-commerce; as *prospectors* if they had not adopted e-commerce, but had a specific plan to adopt e-commerce within one year; and as *laggards* if they neither had a specific plan nor intention to adopt e-commerce. From the total 386 responses, one hundred and seven firms (27.7%) were classified as adopters, fifty-two firms (13.47%) as prospectors, and two hundred and twenty seven (58.8%) as laggards. Table 5 summarizes on the number of firms for the three organization types.

Table 5. Distribution of the three organization types

Organization Type	Number	Percentage
Adopters	107	27.72
Prospectors	52	13.47
Laggards	227	58.8
Total	*386*	*100*

Measure

Organization size was determined by the number of full time employees. Respondents were asked to specify the number of employees whether they had lower than 10 employees, 10 - 30, 31-50, 51- 100, and higher than 100. Top management support was measured by a three item scales assessing top management's interests and understanding in e-commerce and perceptions of top management towards e-commerce.

Existence of IT department was measured by asking respondents whether they formally had IT department within their organizations. The answers were coded to "0" for having an IT department and "1" for no IT department. A score for each organization type was calculated by dividing the total score with the number of firms in each type. Therefore, the lower the average score, the more the organization type had an IT department.

Perceived compatibility is assessed by a three items scale; Perceived benefit is measured by a five item scale. These two scales were developed based on prior studies scales (Thong, 1999). Finally, we used a three-item scale to assess industry competitiveness, measuring the number of competitors adopting e-commerce, the success and failure of the competitors in adopting e-commerce.

The four multi-item factors proposed in the model, top management support for e-commerce, perceived compatibility, perceived benefit, and competitiveness, were evaluated for reliability, convergent validity and discriminating validity. The reliability was assessed by computing Cronbach's alpha. The alpha values of the four factors were higher than the threshold value, 0.6 (Nunnally, 1967). Factor analysis was used to examine the convergent and discriminant validity. A Principal Components Analysis with VARIMAX rotation was performed. One item measured perceived compatibility was dropped due to having a high factor loading in more than one component. A further factor analysis revealed a proper loading on four-factor structure.

ANALYSIS

Since the main objective of the hypotheses is to test the differences among the three organization types based on the identified factors, Analysis of Variances (ANOVA) was employed to analyze a mean difference among the three groups. A post-hoc multiple comparison (Scheffee's) was subsequently employed to perform a pair-wise comparison of the mean difference among the three organization types. Results from ANOVA analysis supported all of the hypotheses. In particular, analysis results strongly support hypothesis 2-5 ($p < 0.001$), support hypothesis 1 ($p < 0.01$), and moderately support hypothesis 6 ($p < 0.05$). Table 6 presents the statistical analysis results.

Table 6. Statistical Analysis Result

Variables	F Statistic	Adopters		Prospectors		Laggards	
		Mean	SD	Mean	SD	Mean	SD
Size	4.73**	2.56	1.72	1.82	1.22	2.12	1.48
Top management support for e-commerce	26.39***	4.03	0.81	3.9	.13	3.33	.06
Existence of IT Department	33.73***	1.49	.50	1.80	.404	1.87	.34
Perceived Benefits	10.203***	3.62	.80	3.69	.87	3.2	1.0
Perceived Compatibility	30.57***	3.75	.69	3.59	.84	3.01	.92
Industry Competitiveness	3.89*	4.00	.10	3.66	.154	3.66	.7

*p < 0.05; **p < 0.01; ***p<0.001

Furthermore, pair-wise analysis was performed to determine the mean difference among the three organization types (Table 7). The results suggest that adopters and laggards were significantly different in all variables. However, the results of the mean difference between adopters and prospectors and between prospectors and laggards are mixed. In particular, adopters and prospectors are significantly different in size, and existence of IT department. Prospectors and laggards are significantly different in perceived benefits and perceived compatibility. Table 7 shows the result of pair-wise analysis.

Table 7. Pair-wise Analysis of the Mean Difference among the Three Organization Types

Variables	Mean difference between Adopters & Laggards	Mean difference between Adopters & Prospectors	Mean difference between Prospectors & Laggards
Size	Significant*	Significant*	Not Significant
Top management support for e-commerce	Significant***	Not Significant	Not Significant
Existence of IT Department	Significant***	Significant***	Not Significant
Perceived Benefits	Significant**	Not Significant	Significant*
Perceived Compatibility	Significant***	Not Significant	Significant***
Industry Competitiveness	Significant**	Not Significant	Not Significant

*p < 0.05; **p < 0.01; ***p<0.001

DISCUSSION AND CONCLUSIONS

It is unarguable that e-commerce is becoming one of the key technologies driven businesses in the current dynamic environment. A study of e-commerce would expand our understanding on the rational underlying the thinking logic of firms in adopting the technology.

Results from our statistical analysis reveal insides on key factors that influence adoption decision of SMEs in Thailand. Overall, the results strongly support the hypotheses, which is consistent with prior studies of IT innovation in other Asian countries (e.g., Thong (1999)), reinforcing that key variables identified from the organization innovation theory are applicable in the context of Asian settings, and in the context of e-commerce innovation. In particular, we found that adopters significantly differ from laggards in all key variables. While prospectors are significantly different from adopters in size and existence of IT department, they are significantly different from laggards in perceived benefits and perceived compatibility.

A number of conclusions can be drawn based on these results. First, the amount of strategic emphasis firms give to IT (i.e., IT-related knowledge, resources, and capabilities) has an impact on e-commerce adoption intention. Firms that strongly support the use of Information Technology, by formally establishing IT department,

are more likely to adopt e-commerce earlier than firms with less IT support. Firms that have IT assets (i.e., IT knowledge, IT capabilities) readily in place should be in a better position to adopt and implement e-commerce than firms that need to start building technology knowledge and infrastructure required for e-commerce adoption.

Second, we found that prospectors significantly differ from laggards in technology factors—perceived benefits and perceived compatibility—whereas there is no difference between prospectors and adopters in the technology factors. These results imply that technology factors do have an influence on attitudes toward e-commerce (i.e., changing from unfavorable—laggards—to favorable tendency—prospectors), but have no influence on a relative earliness of adoption stage (i.e., no change from prospectors to adopters). This finding is consistent with the model of the innovation-decision process (Rogers, 1995) on the point that perceived characteristics of the innovation play a major role during the persuasion stage. One explanation to this phenomenon is the cost-benefits justification. Due to limited resources, laggards may hesitate to invest in new technologies because they are uncertain about the benefits of e-commerce and the compatibility of the technology with their existing culture and business environment. On the other hand, adopters and prospectors are more willing to take risks of e-commerce adoption since they perceive a more perceptible contribution of e-commerce to their businesses, and are more certain on the compatibility of the technology with their organizations.

Third, e-commerce adopters are more likely to operate in a more competitive environment, compared with the other two organization types. This result is consistent with prior studies that point to the environmental factors as the key factors influencing SMEs decision to adopt innovation (e.g., Iacovou et al., 1995). This also implies that SMEs operating in competitive environment are constantly scanning and implementing new technologies such as e-commerce.

Limitations

It is appropriate to mention the limitations of this study before discussing the implications. First, the data used in this study was collected in 1999. At that time, diffusion of e-commerce in Thailand was still in an infant stage. From our survey, only twenty-percent of respondents were e-commerce adopters. This adoption profile will be unlikely if the survey is conducted nowadays. Nevertheless, we believe that the results from this study would be valid even testing with a more current sample. Second, due to the nature of our hypotheses formulating, it does not allow comparison testing on the effect of the independent variables. This limitation restricts the ability to determine the predicting power of independent variables for e-commerce adoption.

Third, the focus of the research model has been on the relationships among constructs identified in this study. The variables included in the research model are not intended to be comprehensiveness. They are selected as representing key theoretical factors potentially affecting organizations' adoption decision. The findings should be viewed with caution in so far as other potentially important factors have been excluded.

Finally, this study used single-respondent perceptual measures for various constructs. The use of single respondents helped in obtaining the necessary response rate; however, the results would have been more rigorous if multiple respondents had been used to measure the research constructs.

Implications

This study has implications for both research and practice. For research, this study is one among a few which empirically test the organizational innovation model in the context of Thailand. The results of this study can be used as a guideline for future research that wishes to examine the phenomenon in other Asian settings. This study also reaffirms that the innovation adoption theory, widely applied in North America or European countries, is applicable in the Asian context. For future research, while this study incorporates a number of key variables identified from the literature, future studies may expand the research model by incorporating various variables to cover a more comprehensive aspects of the phenomenon, such as variables reflecting key aspects of e-commerce, variables reflecting SMEs context, and variables representing a gap between Asian and Western cultures.

In addition, this study examines only one aspect of e-commerce adoption, the extent to which an organization is relatively earlier to adopt e-commerce than others. Future study may attempt to test other aspects of e-commerce adoption. The diffusion of innovation literature can be used as a foundation to develop dependent variables. Fichman (2001), for example, identified a number of measures of organizational innovation such as earliness of adoption, infusion, and assimilation. While these variables are widely used specifically in the context of Information Technology, they can be applied in the context of e-commerce. For instance, future study may develop a research model to test the infusion of e-commerce in SMEs (i.e., the extent to which e-commerce is used in a complete and sophisticated way). By adopting a more sophisticated measure, future study might apply a more sophisticated technique in testing the relationships in the research model, such as linear regression and structural equation modeling techniques (i.e., LISREL, PLS).

For practitioners, our study highlights the importance of IT skills and knowledge in influencing e-commerce adoption. This study shows that knowledge-based about IT plays a major role in influencing a firm's adoption decision. SMEs that strongly support IT deployment (i.e., high level of IT investment, existence of IT department) are more likely to adopt e-commerce earlier than those with less IT support. Since e-commerce is a key technology driving businesses in a current competitive environment, the earlier the firms adopt e-commerce, the faster the firms can extend their reach to customers and secure their share in the market by using a market access capability of e-commerce. However, knowledge-based skills and technologies required to adopt e-commerce cannot be acquired overnight. It takes time to accumulate. Hence, SMEs should cultivate and develop their own IT skills and knowledge to be readily in place so that they can adopt and implement e-commerce to respond to competition in a timely manner.

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