The Relationship between Business Factors Affecting Information and Communication Technology Adoption in The Thai Banking Industry

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ABSTRACT

The purpose of this study is to investigate the business factors that influence bank's decision to adopt information and communication technology (ICT) in Thailand. This study seeks not only to examine the relationship between the banks' adoption decisions and business factors but also to discover which of these factors are most important in influencing ICT adoption. A self-developed questionnaire survey was carried out to measure the influence of business factors and ICT adoption in the Thai banking industry. A questionnaire used to collect data was sent to 600 employees (executives, middle-level managers and operating employees) of Thai banks in the Bangkok area. Completed questionnaires were received from 416 respondents- a response rate of 70%. The findings revealed no difference between three groups (top management, middle managers and operating employees) in terms of their usage of ICT within the banks. Multiple regression analysis results indicated that all six business factors were significant. The business factors affecting adoption of ICT (in descending order of impacts), were organizational competency, environmental characteristics, technological characteristics, technological attitude, decision-maker's characteristics, and organizational characteristics.

บทคัดย่อ

งานวิจัยนี้ต้องการศึกษาปัจจัยทางธุรกิจที่มีผลต่อการใช้เทคโนโลยีสารสนเทศและการสื่อสารของธนาคารพาณิชย์ในประเทศไทย ตลอดจนปัจจัยทางธุรกิจที่ส่งผลต่อการใช้เทคโนโลยีและการสื่อสารสารนั้นๆ มากที่สุดและรองเป็นลำดับลงมา การศึกษาวิจัยนี้เก็บข้อมูลจากพนักงานธนาคารพาณิชย์ในประเทศไทย จำนวน 600 ราย และมีผลตอบรับจากการทำวิจัย ทั้งสิ้น 416 ราย หรือคิดเป็น 70% ผลการวิจัยแสดงให้เห็นว่าผู้ตอบคำถามทั้งสามกลุ่ม (ผู้บริหารระดับสูง ผู้บริหารระดับกลาง และพนักงาน) มีความคิดเห็นตรงกันเกี่ยวกับการใช้เทคโนโลยีสารสนเทศและการสื่อสารภายในธนาคาร โดยเรียงลำดับความสำคัญของปัจจัยที่มีผลกระทบต่อการใช้เทคโนโลยีการสื่อสารและสารสนเทศ ดังนี้ ความสามารถของธนาคาร สิ่งแวดล้อมของธนาคาร ลักษณะของเทคโนโลยี ทัศนคติที่มีต่อเทคโนโลยี คุณลักษณะของผู้บริหาร และลักษณะของธนาคาร

INTRODUCTION

The rapidly changing business environment of the financial services sector has led to an expansion in innovation-related activities (Blazevic & Lievens 2004). As a result, technology in general and information and communication technology (ICT) in particular, have become the most powerful strategic weapons for banks to ensure profitability and to develop their market position (Consoli, 2005).

The banking industry in Thailand requires rapid modification and adaptation to keep harmony with the world economy business. The Thai banks are adapting to survive by improving corporate management, adding more value to their services, and introducing new and more convenient services. However the ICT adoptions by Thai banks are even slower than in other Asian countries markets, mostly due to the lack of technical skills.

However, ICT adoption by Thai banks also raised uncertainties about the way in which banking activities could be organized in order for banks to take advantage of the new technological opportunities. The banking industry, thus, offered an interesting research field to explore the factors that encourage Thai banks to adopt ICT in Thailand and to use the findings to develop strategies for Thai banks on how to maximize the level of ICT adoption. His study aims to investigate the relation-ship between six business factors affecting information and communication technology adoption in the Thai banking sector.

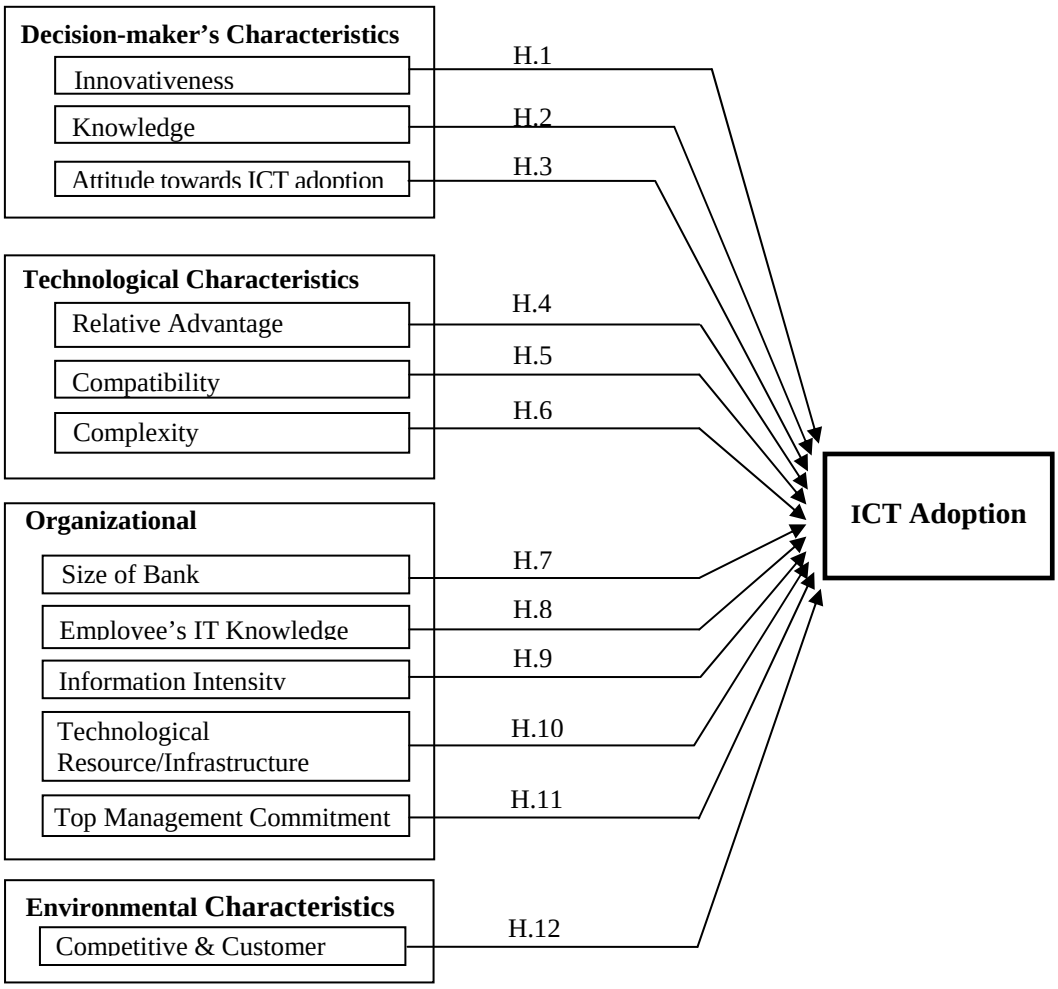
LITERATURE REVIEW AND HYPOTHESES

As illustrated in Figure 1, conceptual framework for this study has been constructed in order to investigate factors that affect ICT adoption in the banking industry within the specific context of Thailand. Theories of innovation diffusion, organizational adoption, technology acceptance model, theory of planned behavior and change management were used to develop an initial framework for affecting bank users' diffusion of ICT within the Thai banking industry.

ICT Adoption

The dependent variable is the adoption of ICT. Adoption has been explained as a decision to make full use of an innovation as the best course of action (Rogers, 1983). By applying this theory in this study, the adoption of ICT is defined as a collective term for a wide range of software, hardware, telecommunications and information management techniques, applications and devices, that are used to create, produce, analyze, process, package, distribute, receive, retrieve, store, and transform information (Brady et al.,2002).

Figure 1 Research Model of The Relationship between Business Factors Affecting ICT Adoption in the Thai Banking Industry



Decision-maker's Characteristics

Decision-maker's Innovativeness

Innovativeness is commonly defined as a person's tendency to try out new things (Hirschman, 1980; Shih & Venkatesh, 2004). The innovativeness of an individual is a persistent trait that is reflective of an individual's underlying nature when exposed to an innovation. Based on the Diffusion of Innovation Theory, personal innovativeness (also known as technology readiness) (Massey et al., 2005) embodies the risk-taking propensity which exists in certain individuals and not in others (Agarwal & Prasad, 1998; Bhatnagar et al., 2000; Parasuraman, 2000; Massey et al., 2005,). Some people are more likely to take a risk of adopting an innovation due to their differences in innovativeness (Rogers, 2003).

Therefore, given the same level of beliefs and perceptions about an innovation, top management/ CEO with higher personal innovativeness are more likely to develop positive attitudes towards adopting it than less innovative individuals (Agarwal & Prasad, 1998). The CEOs characteristic in terms of innovativeness has been found as the most significant factor influencing e-commerce adoption both in Australia and Denmark (Scupola, 2009). The above viewpoints lead to the following hypothesis:

Hypothesis 1: CEOs' innovativeness is positively related to the adoption of ICT in the Thai banking industry.

Decision-maker's IT Knowledge

The more experienced the top management/ CEO, the more open and receptive (s)he is to investments in innovation activities. If the top management/ CEO are knowledgeable regarding a new technology, they are likely to be better capable of dealing with technology adoption (Lin & Lee, 2005). Wainwright et al. (2005) added that top management/CEO ICT skills, ICT knowledge, and ICT practices are important determinants of whether IT is adopted or rejected by the potential users. The more knowledge of the technological innovation that top management/ CEO has, the more likely that the bank will decide to implement a ICT adoption policy. This implies that if top management/CEO could be educated about the benefits of ICT, they would be more willing to adopt such technology. Therefore, the following hypothesis was proposed:

Hypothesis 2: CEOs' IT knowledge is positively related to the adoption of ICT in the Thai banking industry.

Attitude toward IT adoption

Attitude is an individual's positive or negative feelings about performing the target behavior (Davis 1989). Chau and Hu (2001) found that users are more likely to use new innovations if they have fun interacting with those innovations. Within the decision-maker context, the top management/manager's attitude is a very commonly studied factor in IT/ICT adoption research. Empirically, the literature has illustrated that attitude has a significant influence on the intention to adopt IB (Mirchandani & Motwani, 2001; Chau & Lai, 2003; Cheng et al., 2006; Sabherwal et al., 2006; Shih and Fang, 2006; Scupola, 2009). A number of studies have found that CEOs who have a positive attitude towards IT adoption tend to be more likely to adopt information technology (Seyal et al., 2003). Mehrtens et al. (2001) also studied the CEO attitude towards adoption of IT and found a direct link with the success of the adoption process. Therefore, it is reasonable to hypothesize:

Hypothesis 3: Attitude toward IT adoption is positively related to the adoption of ICT in the Thai banking industry.

Technological Characteristics

Relative Advantage

Relative advantage is defined as "the degree to which an innovation is perceived as being better than the idea it supersedes." Relative advantage has been found to be one of the best predictors and is positively related to an innovation's rate of adoption (Tan & Teo, 2000). Relative advantage attributes also have an influence on users' perceptions of technology (Igbaria et al., 1997; Lederer et al., 2000). The greater the perceived relative advantage of an innovation, the more rapid its rate of adoption will be (Rogers, 1995).

Hypothesis 4: Relative advantage is positively related to the adoption of ICT in the Thai banking industry.

Compatibility

Compatibility has also been found to have a positive significant relationship with innovation adoption (Tornatzky & Klein, 1982; Rogers, 1983; Verhoef & Lnagerak, 2001). Compatibility is the degree to which an innovation is perceived as consistent with the existing values, needs, and past experiences of the potential adopter (Roger, 1983). Compatibility also includes the extent to which a technology aligns with the firm's needs, including the alignment of a firm's IT strategy with its business strategy (King & Teo, 1996; Walczuch et al., 2000). For technology innovations, it is especially important that they fit with the most commonly installed hardware platform and operating systems (Thong, 1999) Compatibility with current applications is a major concern in the adoption decision. If ICT is seen as compatible with the existing work practices, environment, and overall objective, organizations will be more likely to adopt it.

Hypothesis 5: Compatibility is positively related to the adoption of ICT in the Thai banking industry.

Complexity

The perceived complexity of the innovation has been found to be a significant negative factor on innovation adoption and knowledge transfers in most of studies (Tornatzky & Klein, 1982; Rogers, 1983; Simonin, 1999; Verhoef & Langerak, 2001), but not in all (Beatty et al., 2001). Complexity is defined as "the degree to which an innovation is perceived as relatively difficult to understand and use." Systems that are perceived to be easier to use and less

complex have a higher likelihood of being accepted and used by potential users (Agarwal & Prasad, 1997). Moreover, Akbulut (2002) stated that the complexity of a technology has a major effect on the adoption decision, while Chwelos et al., (2001) stated that complexity is a strong inhibitor of intent to adopt innovation. Therefore, the following hypotheses are proposed to test whether relative advantage, compatibility and complexity also influence banks use of ICT in Thailand:

Hypothesis 6: Complexity is positively related to the adoption of ICT in the Thai banking industry.

Organizational Characteristics

Size of Bank

Business size is one of the most commonly studied determinants of technology adoption (Geroski, 2000; Hall, 2003; Fabiani et al., 2005). A positive correlation between business size and ICT adoption has been found in a number of empirical studies (Teo and Tan, 1998; Thong, 1999; Fabiani et al., 2005; Morgan et al., 2006). Business size is commonly used in the empirical literature on new technology adoption because it is easy to observe and it serves as a proxy for several things (Geroski, 2000): large business can earn higher profits from adopting new technology in comparison with small business. Prior empirical studies seem to support this relationship.With regard to ICT adoption, large banks are more likely to introduce ICT adoption because they have more funds and necessary resources to cover all implementation costs of new ICT technologies. Therefore, it is reasonable to hypothesize:

Hypothesis 7: Size of bank is positively related to the adoption of ICT in the Thai banking industry.

Employees' IT knowledge

Employees' IT knowledge level refers to the familiarity of a bank's employees with technology. Perceived knowledge has a significant positive influence on behavioral intention to adopt an information system in an extended TAM model (Mathieson 1991). Bjork (2002) also found that different users' skills have different influences on the use and adoption of online document management systems. Chun (2003) provided empirical evidence showing that highly educated workers are more likely to implement new technologies such as information technology. If the organization's employees are knowledgeable regarding a new technology, they are likely to be better capable of dealing with technology adoption (Lin & Lee, 2005). Therefore, it can be implied that for a banking organization to adopt an ICT innovation, lack of existing ICT computer skills and experience in ICT may lead to a delay in the actual ICT implementation (Nitithamyong & Skibniewski, 2003; Thorpe, 2003; Stewart and Mohamed, 2002; Love et al., 2001; Stephenson & Blaza, 2001). Based on the above, the following hypothesis is proposed:

Hypothesis 8: Employees' IT knowledge is positively related to the adoption of ICT in the Thai banking industry.

Information Intensity

Information is a key operational factor of any organization. As banking activity is information intensive, it is based on information sharing (Canato & Corrocher, 2004). How it is collected, collated, stored, and retrieved is critical to the survival of a business - especially in the banking industry. Banks collect and process information by product and transaction, not by customer. In sharing information, ICT applications can facilitate banking activities by helping to acquire, analyze, and deliver data to all relevant users.

The adoption of ICT applications can help in the development of new financial services and products. Moreover, the greater the information intensity, the greater the potential for strategic uses of ICT in a business. Greater information intensity will lead the decision makers of a bank to perceive ICT as a major competitive tool and therefore, increase the ICT adoption. The above viewpoints lead to the following hypothesis:

Hypothesis 9: Information intensity is positively related to the adoption of ICT in the Thai banking industry.

Technological Resource/Infrastructure

Technical and infrastructural support for a technological innovation may be an important requirement for its diffusion (Chau & Hui, 2001). Technology infrastructure refers to technologies that enable Internet-related businesses, as well as human resources professionals possessing IT knowledge and skills, to implement Internet-related applications" (Zhu & Kraemer, 2005). In fact, resources con-straints are reported as one of the reasons that benchmarking findings were not implemented (Davies and Kochhar, 2000; Jarrar & Zairi, 2000). Adequate investment and management of information technology infrastructure are the foundation of information technology adoption. Therefore, Thai banks with greater technology readiness are in a better position to initiate, adopt, and routinize ICT adoption. Therefore, the following hypothesis is proposed:

Hypothesis 10: Technical resource/infrastructure is positively related to the adoption of ICT in the Thai banking industry.

Top management Commitment

Top management commitment is a significant predictor of technology adoption and leads to more successful computer use in both large and small businesses (Seyal et al., 2003). Top management commitment has a key role in the ICT adoption decision because this support is essential for development of infrastructure and people for ICT adoption within the organization (Tang, 2000; Al-Gharbi & Atturki, 2001; Eder & Igbaria, 2001; Bajwa & Ross, 2002;

Christensen & Walker, 2004; Jeyaraj et al., 2006; Sabherwal et al., 2006). The support of a top management champion can have a positive impact on adoption (Mehrtens et al., 2001). In addition, Heung (2003) reported that top management commitment is an important factor for travel agencies when they decided to implement e-commerce. Chwelos et al. (2001) stated that the level of management understanding of using IT to achieve organizational objectives might influence the adoption of IT innovation. The successful adoption and implementation of technological innovations within organizations has often been related to the support of top management (Jeyaraj et al., 2006; Sabherwal et al., 2006). Thus, in light of the above discussion it is hypothesized that

Hypothesis 11: Top management commitment is positively related to the adoption of ICT in the Thai banking industry.

Environmental Characteristics

Competition and Customer

Environmental factors, such as the degree of competition, the stability of demand for products, and the degree of customer loyalty, cannot be controlled by the management of an organization, but can affect the way the business is conducted. An environment with success stories and pioneering adopters can also raise awareness and encourage innovation adoption (Elliot, 2002; Gharavi et al., 2004). Thus, competition may first drive firms to initiate and adopt innovations to maintain a competitive edge.

In the case of (small) open economies like Thailand, international competition is a particularly effective way of forcing firms to adopt the most efficient way of producing, or to temporarily evade competitive pressure through product innovations. The more intense the competition in an industry, the stronger is the pressure on an organization to adopt alternative innovations in order to gain or maintain competitive advantage (Damsgaard & Lyytinen, 2000; Chwelos et al., 2001; Zhu & Weyant, 2003). Therefore, banks facing a great degree of competition tend to invest more on information technology. Thus, bases on the discussion above, the following hypothesis is proposed:

Hypothesis 12: Competition and customers are positively related to the adoption of ICT in the Thai banking industry.

RESEARCH METHODOLOGY

Survey research was used in this study and a questionnaire was used a gathering tool. The well-established banks in Thailand were solicited to participate in this study. Consistent with Bank of Thailand regulations, prospective commercial banks respondents were classified into four major groups: Thai commercial banks, retail banks, foreign banks branches, and subsidiaries. The sample groups were selected from among 34 banks located in Bangkok composed of 33 commercial banks and one bank classified as a specialized financial institution -- the Government Saving Bank or GSB. Moreover, the GSB was the only bank in the specialized financial institution category from which data were collected in this study.

The main reasons for including the Government Housing Bank or GSB as a primary data source were as follows:

1. Nowadays, GSB is a juristic personal and state enterprise which operates as a financial institute guaranteed by the government under the supervision of the Ministry of Finance.

2. The Government Savings Bank's business is conducted in three areas: 1) providing savings deposit service which includes the Government Savings Bank Lottery service, and life and family welfare savings: 2) providing financial services to customers; and 3) engaging in private investment for profit-making.

RESULTS

Demographic Information Analysis

Respondents were classified by organizational level into three groups of employees: executives (top management), mid-level managers, and operating employees. Subsequently, 416 responses (n = 416) were received representing a 70.0 percent response rate. The largest respondent groups (44.7 percent) was for mid-level managers (n = 186), while top management (executive level) was next at 34.2 percent (n = 142), and the remaining respondents were operating employees with a 21.1 percent response rate (n = 88).

Table 1 shows that, by far, the largest percentage of respondents came from the category "Thai Commercial Banks." Four banks in this category had at least 40 employees: Krungthai Bank (14.5 percent), Siam City Bank (12.3 percent), Siam Commercial Bank (11.6 percent), and Kasikornthai Bank (11.3 percent). With the exception of Hong Kong and Shanghai Banking (1.3 percent), no Foreign Banks Branches had as much as one percent of the overall sample.

Table 1 Classification of Respondents by Type of Bank (N=416)

Banks	Number of Respondents	Valid Percent
Thai Commercial Banks:		
Bangkok Bank (BBL)	34	9.1
Krungthai Bank (KTB)	54	14.5
Krungsri Bank (BAY)	28	7.5
Kasikornthai Bank (Kbank)	42	11.3
Kiatnakin Bank	2	0.5
Thai military Bank (TMB)	25	6.7
CIMB Thai Bank	21	5.6
Siam Commerical Bank (SCB)	43	11.6
Thanachart Bank	23	6.2
Siam City Bank (SCIB)	46	12.3
United Oversea Bank (Thai) (UOB)	3	0.8
Standard Chartered Bank (Thai)	1	0.3
ACL Bank	17	4.6
Retail Banks:		
The Thai Credit Retail Bank	8	2.1
Land and House (LH)	8	2.1
Subsidiaries:		
Mega International Commercial	4	1.1
Specialized Financial Institutions:		
Government Savings Bank (GSB)	33	8.8
Foreign Banks Branches:		
Calyon	1	0.3
JPmorgan Chase Bank,	1	0.3
Citibank, N.A.	3	0.8
Sumitomo Mitsui Banking	1	0.3
Deutsche Bank AG.	1	0.3
Mizuho Corporate Bank	1	0.3
The Bank of Tokyo-Mitsubishi UFJ,	1	0.3
Bank of China Limited	1	0.3
Bank of America, National Association	1	0.3
RHB Bank Berhad	2	0.5
ABN-Amro N.V.	1	0.3
Indian Oversea Bank	1	0.3
Oversea-Chinese Banking Corporation	2	0.5
The Hong Kong and Shanghai Banking	5	1.3
	N= 416	100

Reliability

The research instrument used Cronbach's alpha and common factor analysis to examine reliability and validity. The overall Cronbach's alpha coefficient of 0.949 shows a very high level of internal consistency. Ideally, the alpha coefficient of scale should be above 0.7 (Nunnally, 1978; Malhotra, 2004; Pallant, 2005). The Cronbach's coefficients in this study range from 0.672 to 0.924. Thus, all six constructs for the independent variables in this study are considered to have adequate reliability for the next stage of analysis.

Factor Analysis

A factor analysis was conducted to develop constructs that were helpful for analyzing the questionnaire responses and for evaluating factors that influence ICT adoption in Thai banking. Thirty-three variables were grouped into 6 factors and each factor was named on the basis of variables within that factor. Together, the six factors explain 46.14 % of the overall variance. In this study, the six factors, ranked in order of eigenvalues, were: "technological attitude", "organizational competency", "environmental characteristics", "organizational characteristics", "decision-maker characteristics" and "technological characteristics." In conclusion, the research model was confirmed as reliable and valid for further analyses.

Descriptive Statistics of Independent and Dependent Variables

Table 2 Summary of Compared Means and Standard Deviation of a Factors among Three Groups of Management Level and the Level of ICT Adoption

Transactions	Top Management		Mid-Level Management		Operating Employee		F	Sig
	Mean	S.D.	Mean	S.D.	Mean	S.D.		
Decision-maker Characteristics								
Innovativeness	3.82	.647	3.76	.635	3.54	.704	4.964	.007
Knowledge	3.74	.734	3.72	.745	3.53	.777	2.199	.112
Attitude towards IT adoption	3.86	.729	3.90	.756	3.72	.790	1.713	.182
Technological Characteristics								
Relative advantage	4.06	.679	4.07	.740	4.06	.643	.011	.989
Compatibility	3.56	.682	3.52	.744	3.63	.685	.674	.510
Complexity	2.85	.794	3.05	.737	2.85	.747	3.360	.036
Organizational Characteristics								
Size of Bank	4.01	.691	3.90	.793	3.90	.716	.966	.381
Employee's IT knowledge	3.60	.675	3.56	.663	3.60	.717	.175	.840
Information Intensity	3.83	.660	3.91	.773	3.71	.610	2.179	.115
Technological Resource/Infrastructure	3.86	.599	3.72	.641	3.68	.636	2.811	.061
Top Management Commitment	3.80	.649	3.78	.666	3.67	.653	1.113	.330
Environmental Characteristic								
Competitive and Customer	4.15	.659	4.09	.722	3.95	.709	2.075	.127

Note: 1 = very low level adopted to 5 = very high level adopted

Table 2 reports the findings from means and standard deviation between all variables among three groups of management level and the level of ICT adoption. There were no statistically significant differences for any of the items of the 12 variables towards ICT adoption among three groups of employees – top management, middle managers, and operating employees except for innovativeness variable. The analysis showed that, with respect to innovativeness in ICT adoption, a significant difference was found between top management and operating employees as well as mid-level managers and operating employees, but no significant difference was detected between top management and middle managers.

Correlation of Business Factors

The correlations of business factors were used to examine the multicollinerity problems. Table 3 shows the correlations among these groups of factors. The correlation matrix revealed initial evidence of support for the hypotheses of this study: decision-maker, technological, organizational, and environment factors are associated positively with the adoption of technological innovation, ICT.

Table 3 Relationship between Business Driver Factors and ICT adoption

Business Driver Factors	Correlation	Sig	Results
Decision-maker's Characteristics			
Innovativeness	.388	.000*	Supported
Knowledge	.518	.000*	Supported
Technological Attitude			
Relative Advantage	.487	.000*	Supported
Attitude toward IT adoption	.436	.000*	Supported
Technological Characteristics			
Employee's IT Knowledge	.700	.000*	Supported
Complexity	.508	.000*	Supported
Compatibility	.644	.000*	Supported
Organizational Competency			
Technological Resource/Infrastructure	.714	.000*	Supported
Top Management Commitment	.777	.000*	Supported
Organizational Characteristics			
Size of Bank	.465	.000*	Supported
Information Intensity	.562	.000*	Supported
Environmental Characteristic			
Competitive and Customer	.649	.000*	Supported

*p< .001 level

To analyze the relationship between business driver factors and ICT adoption, a correlation analysis was carried out and the results are shown in Table 3. The hypotheses were tested using Bivariate Correlation Analysis. The association between each of the independent variables and dependent variable was analyzed using Pearson Correlation. Significant correlations at the 5% level were not found between ICT Adoption and six business factors. As well as, at the 1% level, significant correlations were found between ICT Adoption and the six business factors. All of the business factors were positively correlated with the ICT adoption rate and the differences were shown to be statistically significant, which indicates that the six business factors had influenced the adoption of ICT. Thus, this supports hypotheses one to twelve by Bivariate Correlation analysis.

Stepwise Regression Analysis

Stepwise regression analysis was applied to relate the twelve independent variables with ICT adoption as the dependent variable. Stepwise regression is conducted by forcing all predictors into the model based on the highest semi-correlation coefficient with the dependent variable without removing any predictor. In this study, factor group 2 was named "Organizational Competency" and emerged as the best predictor variable, accounting for 28.5 %of variance in the adoption of ICT. The fifth group of factors was named "Environmental Characteristics" and accounted for an additional increase of 14.7 % of variance. The first group of factors was named "Technological Characteristics" which accounted for an increase of 5.7 %of variance. The "Technological Attitude" (first factor) accounted for an increase of 4.9 % of variance. Next, the fifth factor group, named "Decision-maker's Characteristics," accounted for an additional 1.8 % of variance. The last (fourth) predictor was "Organizational Characteristics," which accounted for an additional 0.08 % of variance. The adjusted R-squared value of .555 indicated that all the independent variables together explain 55.5% of the variation in the dependent variable (see Table 4). In conclusion, hypotheses one to twelve were supported by stepwise regression analysis (see Table 4). The standard coefficients of all six groups of factors were positive and statistically significant.

Table 4 Stepwise Regression Analysis of Determinants Contributing to Adoption of ICT

Model	UnStandardized Coefficients		Std Coefficients	R	R^2	F	Sig
	B	Std. Error	Beta				
1 ORG – COM	.246	.020	.534	.543	.285	150.417	.000*
2 ORG – COM, ENV –CHA,	.171	.018	.372	.650	.423	138.037	.000*
3 ORG – COM, ENV –CHA, TEC – CHA	.112	.017	.239	.693	.480	115.729	.000*
4 ORG – COM, ENV –CHA, TEC – CHA, TEC- ATT	.102	.016	.220	.727	.529	105.104	.000*
5 ORG – COM, ENV –CHA, TEC – CHA, TEC- ATT, DEC – CHA	.063	.016	.136	.740	.547	90.293	.000*
6 ORG – COM, ENV –CHA, TEC – CHA, TEC- ATT, DEC – CHA, ORG – CHA	.042	.016	.091	.745	.555	77.573	.000*

Constant = 3.749

Note: * $p < .005$

ORG – COM = Organizational Competency
ENV –CHA = Environmental Characteristics
TEC –CHA = Technological Characteristics
TEC –ATT = Technological Attitude
DEC – CHA = Decision-Maker's Characteristics
ORG – CHA = Organizational Characteristics

DISCUSSION OF THE STUDY

Results from statistical analyses revealed a picture of ICT adoption in the Thai banking industry. All hypotheses were supported. Thus, the empirical results provide strong overall validation and point to the importance of coordinating the six groups of business driver factors to improve ICT adoption. Moreover, the findings revealed no differences among the three groups of employees (top management, middle managers and operating employees) in terms of their usage of ICT within the banks.

The factors affecting adoption of ICT (in descending order of impact) were organizational competency, environmental characteristics, technological characteristics, technological attitude, decision-maker's characteristics, and organizational characteristics. Each of these factors will be discussed in more detail in the following sections.

The data analysis showed that organizational competency, in terms of technological resource/ infrastructure and top management commitment, had a major effect on the adoption of ICT. The findings indicate that all three groups of employees seem to be in agreement on the importance of arranging for training programs and requiring their operating employees to have knowledge to implement and use ICT systems and applications. Employees' expertise and confidence to implement and operate a technology-related innovation affect both the human capital available for adoption and its acceptance within the organization (Chau & Hui 2001, Fillis et al., 2004). Training has become a primary factor because it helps employees understand how to best use ICT to solve problems.

Moreover, organizational competence, in terms of top management commitment, has significantly affected ICT adoption. Top management that has a clear vision of the use of ICT and recognizes ICT systems as an important tool to accomplish operations is a key factor in ICT adoption. Typically, the results have revealed that the decision-making responsibility to adopt ICT is placed on top management. This implies that top management is in a key position to strongly influence the initiation and implementation of ICT adoption.

According to the results, environmental characteristics, in terms of competitive and customer aspects, is second in importance as an influencing factor toward ICT adoption by Thai bank industry. All three groups of employees viewed this factor favorably as on the main reasons for ICT adoption. The purposes of ICT adoption by the Thai bank industry (in ascending order of purposes) were increasing service quality, offering new forms of products and services, and building a good image of the bank. As a result, technology in general and ICT in particular, has become one of the most powerful strategic weapons for banks to ensure profitability and to develop their market position (Consoli, 2005).

The overall analysis of technological attitude, in terms of relative advantages and attitude toward ICT adoption and technological characteristics, found this factor to be a statistically significant predictor of ICT adoption by Thai banks. The results also discovered that if employees believed that new ICT was easy to use, they would show less resistance to ICT adoption. They did not only resist but were willing to use ICT intensively and extensively. This finding was consistent with a previous study by Akbulut (2002) which stated that the complexity of a technology has a major effect on the adoption decision. In addition, banks that required their employees to use ICT actively, found that this strategy stimulated the enthusiasm of bank employees to strengthen their ICT skills and reduced resistance to ICT adoption simultaneously.

Next, due to intense competition, the results show that banks require IT skills and knowledge for employee to create new ideas and approaches to work effectively. This finding is in agreement with a previous study (Scupola, 2003) that found that top management was very much interested in the employees' knowledge. Compatibility with current skills was another key issue of concern. This finding was supported by Langerak (2001) who stated that compatibility has a positive significant relationship with innovation adoption.

The research found that decision-maker's characteristics, in terms of innovativeness and knowledge, were a significant predictor of a bank's level of ICT adoption. From previous research results, it can be assumed that the characteristics of top management were self-confidence and learning enjoyment. As a result, self-confidence could be a basic element of self-efficacy that initially motivates individuals to use ICT applications (Peansupap & Walker, 2005)

The organizational characteristics were found to have a significant impact on ICT adoption by Thai banks in terms of size of bank and information intensity. The results showed that size of bank had a high effect on speed to adopt ICT. It can be assumed that large banks were taking more time in cases of full-scale implementation of ICT systems and applications than smaller ones. In addition, the nature of banking activities requires banks to save much data. Surprisingly, the results reveal that banks have currently been using data collection systems that are too complicated. Apparently, operating employees feel uncomfortable with data collecting and processing systems.

MANAGERIAL IMPLICATIONS

The main implications of this study for banks is that adoption of ICT offering more advanced features than just presentation of a bank's information on a web site for marketing purposes or use of e-mail requires a high level of top management commitment. Also, banks should not overlook taking into consideration employees' IT knowledge and skills because those employees might possess valuable knowledge for bank adoption. ICT requires strategic planning, given the fact that adopting ICT implies the allocation of substantial resources and investments required for the adoption of ICT. This planning might involve several departments along with ICT experts, or even external parties such as consultants, to avoid making investments in facilities, equipments, and software system that might end up with failure or that do not support the bank's products, services, or strategies. The application of ICT concepts, techniques, policies, and implementation strategies to banking services has become a subject of fundamental importance and concerns to all banks -- certainly a requirement for local and global competitiveness.

LIMITATIONS OF RESEARCH

The primary limitation of this research was that all of the banks studied are located in Thailand. Therefore, the results should be interpreted with caution when considering other industries or regions.

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