ปัจจัยที่ส่งผลต่อการนำเทคโนโลยีสารสนเทศมาใช้และผลกระทบต่อความสามารถในการสร้างรายได้ของเทศบาลในประเทศไทย

A Model of Factors Affecting Information Technology Adoption and Revenue Generating Performance in Thai Municipality

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บทคัดย่อ

งานวิจัยนี้เป็นการศึกษาหาปัจจัยที่ส่งผลต่อการนำเทคโนโลยีสารสนเทศมาใช้และความสัมพันธ์ต่อความสามารถในการสร้างรายได้ของเทศบาล โดยได้บูรณาการทฤษฎีสถาบัน ทฤษฎีการพึ่งพาทรัพยากรและทฤษฎีการยอมรับนวัตกรรมมาเป็นกรอบในการศึกษา เครื่องมือที่ใช้ในการเก็บรวบรวมข้อมูลได้แก่ แบบสอบถามโดยเก็บข้อมูลจากเทศบาลทั่วประเทศจำนวน 226 แห่ง การประชุมกลุ่มย่อยผู้บริหารเทศบาลจำนวน 10 ราย จากการวิเคราะห์ข้อมูลพบว่าความได้เปรียบเชิงเปรียบเทียบ ค่าใช้จ่ายในการใช้เทคโนโลยีสารสนเทศ ความมุ่งมั่นของผู้บริหาร การรับรู้ถึงความสำคัญของผู้มีส่วนได้ส่วนเสีย การได้รับความรู้และข้อมูลข่าวสารเกี่ยวกับการนำเทคโนโลยีสารสนเทศมาใช้ และการนำเทคโนโลยีสารสนเทศมาใช้ของเทศบาลอื่น คือปัจจัยที่ส่งผลการนำเทคโนโลยีสารสนเทศมาใช้ในเทศบาลและระดับการนำเทคโนโลยีสารสนเทศมาใช้ มีความสัมพันธ์กับความสามารถในการสร้างรายได้จากการจัดเก็บภาษีของเทศบาล ผลของการศึกษาสามารถเสนอแนะในเชิงนโยบายได้ว่าผู้บริหารเทศบาลควรตระหนักถึงความสำคัญของการนำเทคโนโลยีสารสนเทศมาใช้เนื่องจากจะส่งผลต่อประสิทธิภาพในการทำงานและเพิ่มรายได้ รวมถึงควรจัดให้มีการฝึกอบรมเจ้าหน้าที่ของเทศบาลเพื่อให้มีความรู้ความสามารถในการนำเทคโนโลยีสารสนเทศมาใช้เพิ่มมากขึ้นและรัฐควรให้ข้อมูลที่จำเป็นในการใช้ระบบเทคโนโลยีสารสนเทศและมีมาตรการในการกระตุ้นให้ผู้บริหารเทศบาลนำเทคโนโลยีสารสนเทศมาใช้เพิ่มมากขึ้น

คำสำคัญ : เทศบาล เทคโนโลยีสารสนเทศ ทฤษฎีการยอมรับนวัตกรรม

Abstract

The purpose of this study was to determine the factors affecting information technology adoption and the relationship between this adoption and revenue-generating performance

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of municipality in Thailand by using an integration of institutional theory, resource dependence theory, and innovation theory as a framework. With 226 completed questionnaires returned and a focus group, the findings indicated that the level of IT adoption could be predicted by relative advantage, cost, management support and commitment, perceived importance by stakeholders, degree of interconnectedness, and IT adopted by others; and the level of IT adoption was significantly related to revenue generating performance in term of tax collection. The results of the study suggested that municipality management realized the importance of adopting IT systems as it will enhance their efficiency and revenue performance, and should provide IT training for their personnel. In addition, the central government should provide necessary information regarding the use of IT systems and have measures to ensure that the management of the municipalities remains concerned about IT adoption.

Keywords : Municipality, Information Technology, Innovation theory

Introduction

The municipality is a form of local government currently used in Thailand. The municipal governance model is a decentralization tool for local government that allows a close relationship between authorities and the local community. There are 2,441 municipalities in Thailand (Department of local administration, 2015),which are classified into 3 types: 1) the city municipality, 2) the town municipality, and 3) the sub-district municipality. However, since the population is growing and more duties need to be carried out by the municipalities, the municipalities need to be more prepared and work more effectively. Therefore, it is important that the municipalities acquire the “tools” necessaryin order tohelp them improve their efficiency and enhance their revenue-generating performance.

Revenue is an important resource for every organization, and the ability to earn more revenue leads them to have a higher chance of surviving in the environment. Thai municipalities have many sources of revenue, for example, local tax revenue, non-tax revenue, tax sharing, and subsidy. These revenues are resources for the municipalities to manage and use to develop the local community. However, many Thai municipalities are unable to obtain sufficient revenue to manage and develop the local communities under their control. As a result, they have to improve their revenue-generating performance in order to have sufficient resources to support the development of the communities.

Information technology or IT refers to the application of technology to information in order to make this information more useful and so that it can be used in a wider scope.

Information technology includes various technologies for collecting information, systematic storage, recalling information, information processing, information display, and presenting information in an effective way for various users. Currently, information technology, directly and indirectly, plays an important role in running an organization. This is because IT minimizes the constraints concerning time, location, personnel and the accessibility to news and knowledge. Therefore, information technology with such capability allows the organization to survive and gain in competitiveness. As a result, many organizations, including municipalities, have been aware of the importance of information technology and are likely to implement it. However, different municipalities have implemented information technology at various levels. Somemunicipalities for example are using modern information technology systems for all of their duties while some use IT only partially for some duties.

We cannot fully understand how information technology can either help or fail to support an organization's performance unless we understand the factors that influence the decision to adopt this technology. Thus, it is important to know what drives the adoption of information technology and how the adoption impacts the municipality's performancein term of tax collection.

Objectives

1. To classify and identify municipalities in terms of the extent of their IT adoption
2. To determine the factors affecting information technology adoption and the relationship between the adoption and revenue-generating performance of municipality in Thailand
3. To make recommendations for management and government policymakers in terms of supporting and encouraging municipalities to adopt an appropriate level of IT

Research Framework

Factors affecting information technology adoption

On the basis of the integration of institutional theory, resource dependence theory, and innovation theory, this study proposes that the level of IT adoption in the municipality in Thailand will be determined by three primary factors:technological characteristics, organizational characteristics, and the institutional context.

Technological characteristics

Several studies have identified technological characteristics as the factors influencing the decision to accept IT adoption,and these include relative advantage, compatibility, complexity, cost, and security (Rogers, 1983).

Organizational characteristics

Large organizations can better respond to organizational pressure compared to smaller organizations (Goodstein, 1994, pp. 350-382). In addition, large organizations are likely to have more resources and to have excess resources to adopt new innovation (Greening and Gray, 1994, pp. 467-498).

Management support and commitment highly influence any decision made by the organization (Wever and Vorhauer,1993, pp. 19-30). Oncethe management commits to IT implementation, they are likely to give IT higher priority.

Institutional context

Organizations are likely to implement IT in response to the expectations of stakeholders, and the implementation will depend on the perception of the importance of those stakeholders to the organization.

Once a significant number of organizations in an industry have implemented a particular practice, such as IT adoption, the practice is likely to become a norm; then other organizations may perceive resistance to implementation as a risk to the organization's legitimacy and their ability to secure resources (DiMaggio and Powell, 1983, pp. 147-160).

Interconnectedness is the number of connections between individuals within an organizational field. Through these connections, organizations are socialized to accept institutional norms and expectations (DiMaggio and Powell, 1983, pp. 147-160). When IT knowledge and practices have been transferred to the organizations through connections and relations with other organizations, the organizations are likely to accept the information and implement IT practices.

Relationship between adoption and revenue-generating performance

IT can help government public sectors increase their productivityand performance, improve their policy-making, and provide better public services to citizens (Akbulut, 2002). Further, it has been found that there us a significant revenue-generating performance difference between organizations adopting different levels of information technology (Sirirak et al., 2011)

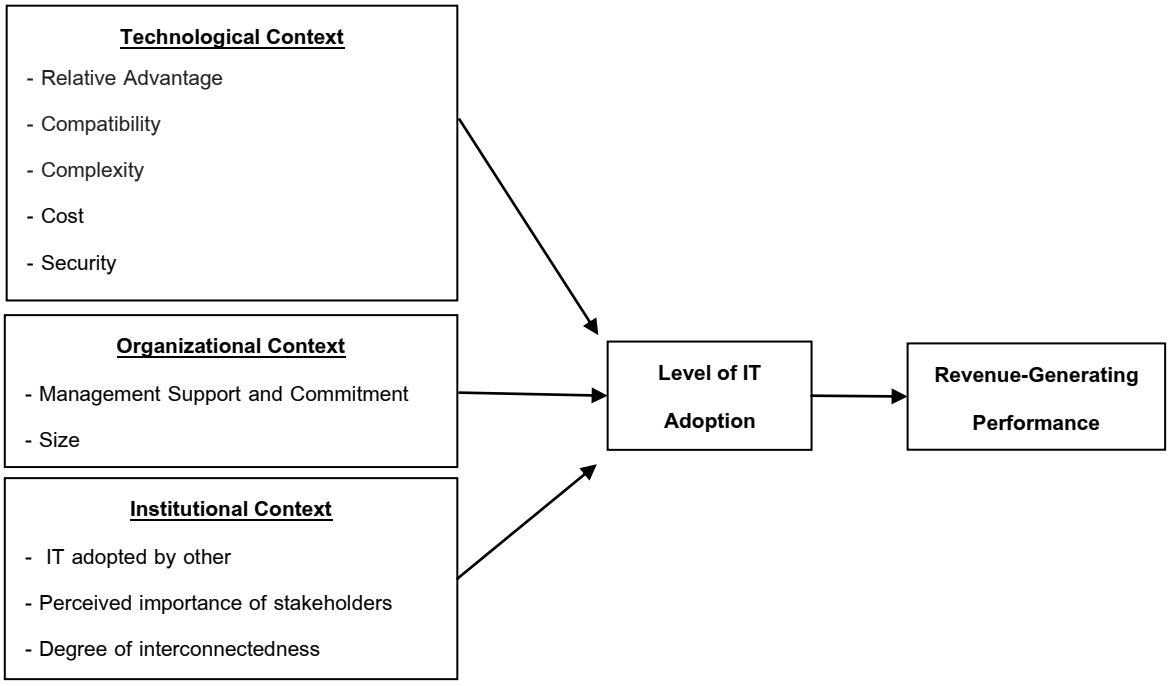

Fig.1 Conceptual Framework

Research Methodology

A mixed-method design can provide detailed and comprehensive data in order to achieve research objectives and answer research questions (Creswell and Tashakkori, 2007). Therefore, this study employed the mixed-method design, which is a combination of qualitative and quantitative approaches to collecting and analyzing data. A focus group was conducted after the survey results had been analyzed with an aim to elaborate on the findings and the relationships suggested by the quantitative analysis.

Population and Sample

The population of this research was comprised of the municipalities in Thailand. For the survey method, a sample was drawn from the municipalities listed in the Department of local administration, Ministry of interior, which accounted for 2,441 municipalities (Department of local administration, 2015). Additionally, this research used regression analysis as a method of determining the factors affecting information technology adoption. The number of samples adequate for this technique should be 15 times the number of parameters (Hair, Anderson, Tatham and Black, 1995, p. 661). In this study, there were 11 parameters included, and therefore the sample size should not have been less than 165 samples, selected by simple random method.

Focus group results were not commonly used to describe how an entire population would respond to the same questions, so the type of sampling used in studies designed to describe the whole populations is not necessary. The common method for selecting participants for focus groups is called "purposive" or "convenience" sampling. This study

purposively selected those members of the community that could provide the best information. The ten participants were administrative staff members selected from municipalities that exhibited different sizes and levels of IT adoption.

Data Collection

A mail questionnaire survey of administrators was used to collect the data. The questionnaire was developed in a three-stage process. First, the questionnaire was initially theory-based designed. This version was reviewed by information technology experts. Second, the initial questionnaire was modified to accommodate the experts' comments and suggestions. The new version was reviewed by municipal clerk. Third, a final version of the questionnaire was designed, drawing on their feedback, and mailed to sample municipalities (226 out of 800 questionnaire returned).

The questionnaire was tested for reliability, which refers to the degree of dependability, consistency, or stability of a scale. The measurement of a variable must be reliable to be useful and to yield stable results. Cronbach's coefficient alpha is a widely-used measure of scale reliability. The Cronbach’s alpha for each scale in this study was above the recommended value of .70, indicating that the scales had sufficient internal reliability (Cronbach, 1951**, pp.** 297-334).

Table 1: Coefficient Alphas for Scales

Scale	Coefficient Alphas
Level of IT adoption	.898
Relative advantage	.959
Compatibility	.878
Complexity	.757
Cost	.835
IT adopted by others	.815
Perceived importance of stakeholders	.856
Degree of connectedness	.918
Management support and commitment	.749
Security	.933

Data Analysis

Cluster analysis was used to classify the municipalities regarding their information technology usage,regression analysis was used to determine the factors affecting IT adoption, and correlation analysis was used to determine the relationship between the level of IT adoption and revenue performance.Scale items were graded using a Likert scale as follows:

6.16 – 7.00 means strongly agree or very high 5.30 – 6.15 means agree or high
4.44 – 5.29 means somewhat agree or quite high 3.58 – 4.43 means do not agree or moderate
2.72 – 3.57 means somewhat disagree or quite low 1.86 – 2.71 means disagree or low
1.00 – 1-85 means strongly disagree or very low

Research Results

Table 2describes the average and standard deviation of the opinions of the respondents regarding IT adoption in the municipality, which revealed that the municipality adopted IT at a moderate level (X=4.25 and SD = 1.15),with the citizenship registration system being the most used (X = 5.96 and SD = 1.48),followed by Internet/intranet, accounting/finance/treasury, and budgeting,respectively. The lowest system was the irrigation system (X = 2.37 and SD = 1.88)

Table 2: Current level of IT adoption in municipalities according to their tasks

IT SYSTEM	Average	Standard Deviation	Definition
1. Citizenshipregistration	5.96	1.48	High
2. Internet/intranet	5.35	1.63	High
3. Account/finance/treasury	5.35	1.49	High
4. Budgeting	5.06	1.73	Quite High
5. Website	5.02	1.55	Quite High
6. Revenue	4.75	1.64	Quite High
7. Taxation	4.72	1.58	Quite High
8. Database	4.46	1.82	Quite High
9. Social welfare/healthcare	4.08	2.12	Moderate
10. Geographical map	3.58	1.95	Moderate
11. Construction/city planning	3.52	1.92	Quite Low
12. Document sorting	3.36	1.92	Quite Low
13.Education/economic	3.12	2.00	Quite Low
14. Prevent and mitigate danger	3.03	2.02	Quite Low
15. Water/irrigation	2.37	1.88	Low
Total	4.25	1.15	Moderate

The results of the cluster analysis, shown in table 3, indicated that municipalities can be classified into 4 clusters according to their current level of IT adoption,which can be explained as follows.

Table: 3: Respondent Municipality Classification

Cluster	Predicted Group Membership: Count (%)				Total	Correlative Classification
	1.00	2.00	3.00	4.00		
1.00	31 (93.9)	2 (6.1)	0	0	33	93.9
2.00	3 (4.1)	69 (93.2)	2 (2.7)	0	74	
3.00	0	4 (6.0)	61 (91.0)	2 (3.0)	67	
4.00	0	0	0	38 (100)	38	

1) The first cluster consisted of 33 municipalities, namely “Laggard”: The municipalities in this group adopted a low level of IT. They only fully used IT in the citizenship registration system and partially in the accounting/finance/treasury, taxing and database systems.

2) The second cluster consisted of 74 municipalities, namely “Reactive”: The municipalities in this group adopted a moderate level of IT. They fully used IT in the citizenship registration and internet/intranet systems and partially with an average usage of IT in website, account/finance/treasury, and budgeting systems. However, they still do not use IT in some IT systems.

3) The third cluster consisted of 67 municipalities,namely “Active”: The municipalities in this group adopted IT in most systems except in the water/irrigation systems, which did not use IT at all.

4) The fourth cluster consisted of 38 municipalities,namely “Proactive”: The municipalities in this group adopted IT in every system. In addition, theyshared information among some systems.

Hypothesis Testing

The regression analysis results in table 4 revealed that there were 6 independent variables that influenced IT adoption in the municipality, which were complexity, management support and commitment, IT adoption by others, relative advantage, degree of interconnectedness, and perceived importance of stakeholders. These six independent variables could explain the IT adoption in the municipality at 48.4% and the equation derived from the regression analysis had$F$ = 19.455 (p-value = .000).

Table 4: Regression Results

Table 5 indicates that the level of information technology adoption in the local

	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	.970	.570		1.703	.090
Compatibility	-.021	.085	-0.14	-.246	.806
Complexity	-.064	.054	-.067	-1.191	.235
Cost	-.173	.049	-.205	-3.519	.001
Management commitment	.247	.061	.240	4.039	.000
IT adopted by others	.141	.066	.139	2.150	.033
Security	.065	.067	.063	.969	.334
Relative advantage	.181	.076	.156	2.372	.019
Degree of connectedness	.102	.046	.122	2.188	.030
Perceived importance of stakeholders	.218	.067	.204	3.269	.001
Size	.000	.001	-0.22	-.413	.680
Adjusted R Squared .484			F-statistic		
19.455					

governance organization positively affected its revenue-generating performance (r = .162 and p-value = .015,whereasthe correlation was significant at the 0.05 level (2-tailed)).

Table 5: Correlation Table

		Level of IT Adoption	Average Revenue Increase of 3 years
Level of IT Adoption	Pearson Correlation	1	.162*
	Sig. (2-tailed)		.015
	N	226	226
Average Revenue Increase 3 years	Pearson Correlation	.162*	1
	Sig. (2-tailed)	.015	
	N	226	226

Discussion

The results of the hypothesis testing indicated that the level of IT adoption in the Thai municipality was determined by six factors. The most influential factor was management support and commitment to IT adoption, followed by cost, perceived importance of stakeholders, relative advantage, extent of IT adopted by others, and degree of interconnectedness, respectively. The municipality tended to adopt IT systems proportionate to the extent of management support and commitment. This finding correspondswith previous study, where the decision-making process in an organization was seen to be made by top management (Oliver, 1991, pp. 145-179). Theresults also showedthatcosthad a negative influence of IT adoption. This finding was consistent with previous research conducted by Tan, Chong, Lin, and Eze (2009),which suggested thatthe cost of IT adoption was an important factor affecting the decision to implement IT. Other results found that the perceived importance of the stakeholderswas positively related to the level of IT adoption. This result supports organizational perspectives, whereby the importance of dependence on institutional constituents induces organizations to conform to their expectations (Tolbert, 1985, pp. 1-13). This finding was also consistent with previous research that suggested that the strategies organizations used in dealing with stakeholders depend on the extent to which those stakeholders are perceived to have the ability to fulfill the "critical" needs of the organization (Jawahar and McLaughlin, 2001, pp. 397-414). The study also found a relationship between the relative advantage and the level of IT adoption in the municipality. This finding supports previous research—that IT adoption benefits are a factor influencing IT adoption and alter human practices (Davis, 1989). Another result indicates that IT adoption by other municipalities in the same area did influence a municipality to adopt IT. This result supports previous studies that suggest thatthe adoption and diffusion of management practices were facilitated by close geographic proximity (Cooke and Morgan, 1998).Finally, the study indicated thatthe interconnectedness or the diffusion of IT through attendance at IT conferences, having membership in an organization (i.e. The National Municipal League of Thailand), and the engagement of external IT consultants influenced the level of IT adoption. These findings supported the institutional perspective, according to which the extent of organizational conformity to institutional norms and expectations depends on the environmental context, specifically the degree of interconnectedness among environmental institutions (Oliver, 1991, pp. 145-179).

This study also reveals that the level of information technology adoption in the municipality is positive significantly related to its revenue-generating performance. This finding is similar to previous findings (Sirirak et al., 2011), which suggested that there was a significant revenue-generating performance difference between organizations adopting different levels of information technology

The results from the focus group study also revealed that the municipality with management that was committed to IT and had higher education was more likely to adopt IT systems. In addition, mayors are local government executive leaders that have been directly elected by the people that live in a local authority area. In order to be reelected, most mayors are likely to invest in infrastructuresrather than IT, as people can easily realize these developments, whereas IT development is more difficult to realize.

Contributions

This study makes many important contributions. First, according to the cluster analysis, the study classified the level of IT adoption by municipalities into 4 groups. As a result, the management of the municipality and policymakers could customize appropriate "tools" in order to encourage further IT adoption by different municipalities according to which group they belong to. In addition, this would help to maximize resource utilization because each municipality would be given the appropriate level of support and help with the further adoption of IT since it is a proven tool for enhancing the performance and efficiency of municipalities. Second, the results of this study are of interest to mayors and municipality clerks faced with decisions regarding IT adoption. The results indicate that municipalities anticipate that they can gain more revenue when they adopt IT systems. This finding, then, can assure the mayor and municipality clerk that the adoption of IT systems will increase their municipalities' efficiency. As a result, municipalities have to adopt IT systems and meanwhile, the central government should have in place measures to ensure that the mayor will be more concerned about the importance of IT adoption in the municipality. Lastly, the personnel in the municipalities have limited knowledge of IT. As a result, IT adoption in the municipalities is often not smoothly carried out, whereas the usage of IT is also limited to certain activities. Therefore, this study suggests that IT seminars or IT training be arranged in order to improve the knowledge of the personnel in the municipalities.

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