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Willingness to pay for cloud computing service of SMEs in Thailand

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Willingness to pay for cloud computing service of SMEs in Thailand

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Abstract

The great promise of cloud computing is the immediate access to enterprise grade software and next generation Information Technology solutions. Cloud service enables SMEs anywhere to expand their market reach, delivery and service, and customer interaction. Some small and medium enterprises (SMEs) are yet to fully realize the advantages of cloud solutions. In the meantime, hundreds of cloud vendors are preparing for the expected major upswing in popularity among cloud services for SMEs and for private consumers. This study examines the factor affecting a decision to use cloud computing service for Thai SMEs. A questionnaire was employed for data collection from a sample of SMEs that use cloud computing technology in the Bangkok area during January 2015- June 2015. A statistic model was utilized in order to analyses the determined factor on using cloud computing service of Thai SMEs. Moreover, the willingness-to-pay (WTP) to additional cloud computing service was calculated. The findings can be used to gauge SMEs demand for improved cloud computing services.

Keywords: *Willingness to pay, cloud service, SMEs*

1. Introduction

Usage of cloud computing service in Enterprise gained popularity and recognition around the world, in particular among Small and Medium Enterprises (SMEs). The cloud will give SMEs an opportunity to use global information technology no different from large enterprises with low investment costs since there is no capital expenditures (CAPEX). SMEs pay as they use. Therefore, they can focus on their business and maintain business continuity. While large enterprises are interested in using cloud computing to create a competitive advantage rather than to save costs. There are three main types of cloud services: Infrastructure as a service (IaaS), platform as a service (PaaS), and software as a service (SaaS). According to Gartner (2015), global spending on Infrastructure as a service (IaaS) is expected to reach almost US\$16.5 billion in 2015, an increase of 32.8 percent from 2014, with a compound annual growth rate (CAGR) from 2014 to 2019 forecast at 29.1 percent.

In Thailand, using cloud computing service has been increased after massive flooding in 2011 which negatively affected hard disk manufacturing industry. Many enterprise users decided to manage the business risk from natural disaster through using a cloud computing service. Market for cloud services computing in Thailand are expected to grow by about 16.7 percent to 22 percent and a total market capitalization of 2,200 to 2,330 million baht in 2014. It grew by 10.6 per cent as compared to 2013. The enterprises will not use the service for reduce their cost only but also manage their big data and business analytics more in the future (Kasikorn Research Center, 2012).

The survey on "Cloud Computing Readiness in Thailand 2014" by the IMC institute in 2014 showed that enterprises in Thailand have a lower level of readiness when it comes to the cloud. An interesting trend discovered by the survey is that even now, large enterprises already use the private cloud in a higher proportion than that of SMEs, due to the fact that they have more complex data in their operations and seek to keep their trade secrets confidential. A higher proportion of SMEs, on the contrary, plan to use the private cloud in the future than that of the large enterprises surveyed

Among the providers of IaaS public cloud in Thailand - such as True IDC, DataPro, EGA (G-Cloud), and iNet - and providers from other countries, the survey found that Microsoft Azure has the highest number of users, followed by True IDC in second place and Amazon Web Services and G-Cloud joint third. Other providers include Fujitsu, NTI and Digital Ocean. The survey also found an increasing number of Thai organizations focusing on cloud computing that comes in a form of open source, while Microsoft Azure dominates the market right now.

For SaaS cloud-computing services, the survey found that most organizations have chosen providers from other countries, with Google App the most popular, followed by Office 365 and Dropbox Enterprise. Besides these three service providers, Thai enterprises plan to use the services of Salesforce, OpenERP, Smartsheet and Amazon in the future (The Nation, 2014).

This information confirmed that there are many computing opportunities in Thailand. With the increase in the use of smart devices, both smart phones and tablets, large enterprises are starting to invest in private clouds. Public cloud services, especially IaaS, are in high demand, as data centers in Thailand start to offer IaaS and independent software vendors explore the SaaS model. This should be the interest of vendors and enterprises. In particular, SMEs in Bangkok Metropolitan area which has about 554,102 enterprises at the end of 2013 or 19.48 of total enterprises (Office of Small and Medium Enterprises, 2013). Moreover, SMEs in this area get advantages from the well –Internet infrastructure, price competition from local cloud service providers both SaaS (application) and IaaS (data centre).

However, the SMEs may lack of awareness and misunderstanding about cloud computing, a variety of price mechanism and security concerns. These factors are important and should not overlook. Hence, this study examines the behavior of SMEs enterprise on using cloud computing service and their willingness to pay for additional securing service and storage space. The survey data during January- June, 2015 was employed together with the statistic model. The results of this study will benefit to both vendor and enterprise. The adoption of cloud computing service is enabling SMEs to compete with larger businesses more efficiently. Meanwhile, service providers such technologies can offer timely marketing strategies to meet the needs of enterprise customers.

2. Overview of Cloud computing service in Thailand

According to the Cloud Readiness Index (CRI) (2014), it confirms a growing trend of cloud computing service in Thailand as compared to other Asia Pacific countries. Thailand is ranked 9 among 14 countries (as shown in Fig. 1). Group of countries can be divided into three groups. Firstly, leading countries consist of Japan, New Zealand, Australia, Singapore, Hong Kong and South Korea. Specifically, Japan retains the honor of being the most cloud-ready country in Asia Pacific. Next, the dedicated improvers are Taiwan, Malaysia, Thailand and the Philippines. Lastly, the steady developing countries are including China, Indonesia, India and Vietnam. The top improvers in Asia Pacific are New Zealand, Australia and Thailand who all moved up four places; the Philippines also

improved two places to finish at 10th place. However, there are at least six indexes that need to be improved for cloud computing service in Thailand which are Privacy, International connection, Data sovereignty, Government regulatory environment and usage, Intellectual property protection, Business sophistication and Freedom of information since these indexes still below the average scores (as Fig.1)

Country & ccTLD	1. Privacy	2. International Connectivity	3. Data Sovereignty	4. Broadband Quality	5. Government Regulatory Env and Usage	6. Power Grid and Green Policy	7. IP Protection	8. Business Sophistication	9. Data Centre Risk	10. Freedom of information	CRI 2014 SCORE	RANK	CHANGE
Japan JP	9.5	5.5	8.0	9.1	5.0	7.1	8.1	8.2	6.6	9.7	76.8	1	-
New Zealand NZ	8.8	4.6	7.9	7.6	5.6	9.2	8.6	6.8	7.8	9.5	76.3	2	+4
Australia AU	8.8	4.4	7.6	8.0	5.3	7.8	7.6	6.7	9.4	9.6	75.1	3	+4
Singapore SG	6.0	8.2	7.8	8.8	6.1	5.9	8.7	7.3	7.4	8.6	74.8	4	-
Hong Kong HK	6.8	7.7	7.6	9.3	5.1	5.6	8.1	7.5	7.4	9.6	74.7	5	-2
South Korea KR	9.7	5.5	7.2	9.4	5.1	6.6	5.7	6.9	8.6	8.6	73.3	6	-4
Taiwan TW	4.6	6.3	6.8	8.5	5.0	6.7	7.4	7.4	6.9	8.6	68.2	7	-2
Malaysia MY	5.8	5.8	6.7	7.1	5.2	4.9	6.9	7.2	8.5	8.2	66.2	8	-
Thailand TH	4.0	5.0	6.2	8.0	3.7	6.3	4.4	6.3	7.6	7.8	59.3	9	+4
Philippines PH	5.8	5.4	5.9	4.1	3.7	5.5	5.1	6.1	5.5	9.0	56.1	10	+2
China CN	5.9	3.0	4.8	5.9	4.3	4.3	5.6	6.2	6.5	7.0	53.3	11	-1
Indonesia ID	4.4	2.9	6.2	3.1	3.9	5.7	5.6	6.3	6.4	7.9	52.4	12	-1
India IN	4.6	2.3	6.5	3.6	4.1	5.0	5.3	6.3	3.4	7.8	48.8	13	-4
Vietnam VN	3.6	3.2	5.6	4.2	3.8	4.7	4.1	5.3	6.4	7.0	47.8	14	-1

Source: Asia Cloud Computing Association 2014

Fig.1 Asia Cloud Computing Readiness Index, 2014

The current cloud ecosystem in Thailand consists of six players which are Infrastructure Providers, IaaS providers, PaaS Providers, SaaS Providers, Cloud community and Government agency. First player is Infrastructure providers which are the telecommunication service provider who gets the license from the nation regulatory agency or the NBTC. The second player is IaaS providers which consist of International providers and local providers. The major local vendor is TrueIDC. Many large enterprises focus on building a private cloud. The third player is PaaS providers and all of them not local providers. Next is SaaS providers. Most solutions that Thai enterprises use are Web application and few of them deploy full cloud platforms. The last two players are government agency and cloud community which provide facilities and updated legislation to promote more cloud computing service.

Thailand Cloud Ecosystem



Source: Pinyopasakul, P. (2014)

Fig .2 Thailand Cloud Ecosystem

The 3rd five – year national ICT master plan (2014-2019) has been drafted to upgrade the country’s technology sector together with the Electric Government Agency (EGA) has announced plans to enhance the development and use cloud in Thailand since 2013. Many stakeholders from government agency side has been worked together to promote the efficient use of G-Cloud and G-ICT use for example, implementing an e-court by the Electronic Transactions Development Agency (ETDA), launching three software services on G-cloud under the G-SaaS initiative from Ministry of Information and Communication Technology (MICT), EGA and Software Industry Promotion Agency (SIPA), Ministry of Labour (MOL) has established a “National Data Centre for Labour” to integrate data from relevant agencies within the MOL and MICT has launched a free WiFi project to promote free access to over 300,000 points all over Thailand, to promote the use of the Internet in public areas, government offices, and designated educational institutions. However, the ICT and cloud development in Thailand does not look promising, as the current political gridlock continues to grind the country’s economic gears to a near-standstill. Regaining the international community’s trust in its regulatory stability is expected to be a major shortcoming for Thailand’s cloud computing industry.

3. Literature review

3.1 Perceived value

Woodruff & Gardial (1996). explained that value is a dynamic abstract concept with meanings that vary according to context. Consumer perceived value by attempting to assess the net

value when weighing what is obtained against what has to be forfeited. Perceived value is significant to managerial level in marketing since it may alter the attitude or satisfaction of consumers and lead to different behaviors, as well as different behavioral consequences. Value has also been viewed as including various elements, both monetary and non-monetary (Helander & Ulkuniemi, 2012). It can be easily confounded with quality, benefits, and price (Janawade, 2013). Sanchez-Fernandez & Iniesta-Bonillo (2009) mentioned that overall theory building has not been strong in the perceived value area. Specifically, firms in information and technology industry have often been accused from being too technology driven and not paying enough attention to their customers' perspective, especially during the development of new products and services (Helander & Ulkuniemi, 2012).

3.2 Perceived usefulness

Perceived usefulness is representative benefits by adopting innovative IT products (David et al., 1992; Kim et al., 2007; Park & Chen, 2007). Mathwick et al. (2001) defined perceived usefulness as the extent to which a person deems a particular system to boost his or her job performance. Tan and Teo (2000) suggested that the perceived usefulness is an important factor in determining adoption of innovations or an information system, as prior research claims (Agarwal & Prasad, 1999; David et al., 1989, Venkatesh, 1999). The ultimate goal of using cloud service is to increase collaboration, flexibility of work practices and access to automatic updates. As a consequence, the greater the perceived usefulness of using cloud services, the more likely that enterprises are willing to pay for the service.

3.3 Performance risk and financial risk

Prior studies have suggested that perceived risk is an important variable that needs to be examined in regards to IT adoption (Chen and Dubinsky, 2003; Teas and Agarwal, 2000; Snoj et al., 2004). Perceived risk referred to perception of consumers on the uncertainty and adverse consequence of using a product or service (Dowling & Staelin, 1994). Sarin et al. (2003) suggested that customers perceive the decision to purchase new high-tech products as risky because these products and their industries exhibit pervasive technological and market uncertainties. Yang et al. (2016) reviewed that a number of risk dimensions have been suggested from previous studies for example, performance and financial risk are the most commonly used to estimate risk (Chen and Dubinsky, 2003 and Sweeney and Soutar, 1999). The financial risk can be determined in a monetary term since it is defined as the possibility of monetary loss due to a customer, including product repair or replacement and refunds (Horton, 1976). The performance risk is presented in non-monetary term because it mainly relates to technicality or loss incurred when a product fails to meet a consumer's expectations (Kim et al., 2007). Cloud computing is new high-tech products, their performance and price may be critical factors in estimations of WTP. Though information and data on the cloud can be accessed anytime and from anywhere at all, there are times when this system can have some serious dysfunction. The other major issue while in the cloud is that of security issue. Enterprises should recognize that they will be surrendering all company sensitive information to a third party cloud service provider. Storing information in the cloud could make the company vulnerable to external hack attack and threats. Thus, perceived performance risk and financial risk is defined as the possibility that the cloud service will not function as expected, and perceived financial risk is defined as the probability of monetary loss incurred from buying cloud service.

3.5 WTP in Information and Technology goods and services

Wettenbroch and Skiera (2002) noted that WTP has been utilized by economists and social science researchers in evaluating demand for goods and services as well as in measuring optimal market prices. Briedert et al. (2006) classified the method to estimate consumers' WTP into four groups: analysis of market data, experiments, direct surveys and indirect surveys. In general, a survey technique is preferred methodological approach since it is very flexible when product features need to be varied and a possible set of prices need to be tested. In many real world applications, a statistic model such as conjoin analysis and discrete choice model are also utilized in order to provide a complementary strengths of the analysis.

A number of WTP in IT goods and services has been implemented for example software (Hsu & Shiue, 2008), broadband (Rosston et al., 2011), Voice over IP (Rappoport et al., 2004), online content (Lopes & Galletta, 2006) and digital content (Kim & Sugai, 2008). However, pricing practices in IT markets have shifted over the last two decades. Traditionally, CPU cycles, data storage and software applications have been sold as products, not services. Clients own the facilities after a one-time payment but have to pay for maintenance and upgrades. Most cloud services vendors have opted for "pay-as-you-go" pricing schemes. Clients are no longer bound to ownership and their payments are closely linked to real usage (Huang et al., 2015). There has been some discussion about the cloud business model recently (Buyya et al., 2009; Durkee, 2010; Marston et al., 2011), but measuring WTP for cloud service in SMEs seem to be lacking in the literature. WTP method is applied in this study based on the survey and examines the amount of money that SMEs are willing to pay for cloud services.

4. Research design

4.1 Research hypotheses

Influences of various dimension of attitude toward cloud service and enterprise perceived risk are considered in the research framework in measure WTP for additional cloud service as presented in Fig.3. This study combined the TAM framework and finding in Hsue & Shiue (2008).The determinant factors of WTP for cloud service are hypothesized as following;

- H1: Perceived value will have a positively relationship to SMEs' WTP for cloud service
- H2: Perceived usefulness will have a positively relationship to SMEs' WTP for cloud service
- H3: Performance risk will have a negatively relationship to SMEs' WTP for cloud service
- H4: Financial risk will have a negatively relationship to SMEs' WTP for cloud service

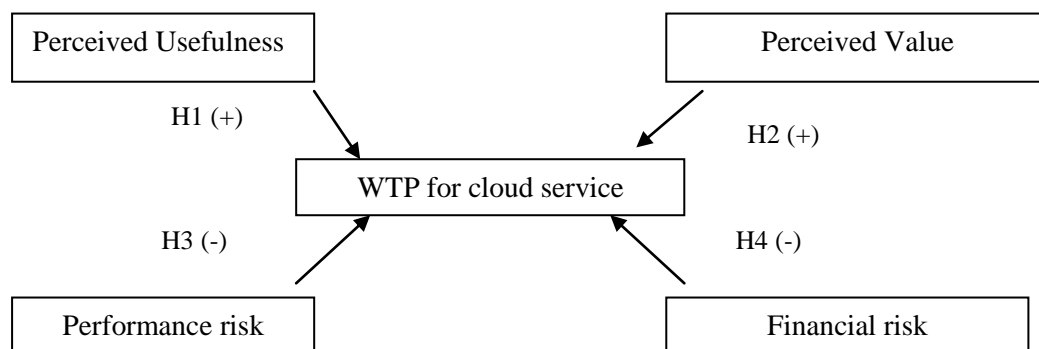


Fig .3 Analytical framework

4.2 Questionnaire and survey

According to the database of IaaS service providers, at least 1,020 SMEs in Bangkok metropolitan area use IaaS service. Therefore, samples were calculated by employed Yamane formula at a 95% confidence interval. The calculated sample for interviewed process was 288 SMEs. Stratified random sampling is used to select the sample respondent. Different strata are identified in the sample district on the basis of most SMEs located area. In each strata of the district, respondent are chosen randomly to reduce selection bias.

The questionnaire is divided into four sections which are demographic data of SMEs, Usage behavior of cloud computing, perception of enterprise (5-item scale) and scenario of willingness to pay for purchasing service individually. Two scenarios were given in this study including data storage and backup and security system service (firewall and Intrusion prevention system).

The formal survey was conducted January 2015 to June 2015. In-person interviewing was used as the survey administration mode. Owner or the officer who have right to make a decision to buy addition service of cloud computing service in each enterprise was interviewed .The valid samples were 288. Table 1 presents a summary of demographic data of SMEs.

Table 1 A summary of demographic data of SMEs

	(N=288)	
Demographic factors	Number	Percentage
<i>Type of business</i>		
Production	84	29.2
Information Technology	72	25.0
Retailing	63	21.9
Service	43	14.9
Wholesaling	22	7.6
Construction	4	1.4
<i>Number of employee</i>		
≤ 15 employees	80	27.8
16-25 employees	34	11.8
26 -50 employees	30	10.4
>50 employees	144	50.0
<i>Duration of operated business</i>		
≤ 2 years	25	8.7
> 2 years - 5 years	87	30.2
> 5 years - 7 years	44	15.3
> 7 years	132	45.8

Majority of SMEs cloud users are SMEs in the production sector was 29.2% per cent, followed by the information technology (25.0%), retailing (21.9%) and service (14.9%) respectively. Among SMEs, the medium enterprise (over 50 employees) mostly use cloud service (50.0%), followed by the very small size (less than or equal to 15 employees) which was accounted for 27.8%. The survey data indicated that the SMEs has operated their business relatively over 7 years(45.8%), greater than 2-5 years(30.2%) and greater than 5-7 years (15.30%).

4.3 Analytical method

This study followed the method of Hsue & Shiue (2008). Cronbach's alpha coefficient was measure to reveal reliabilities of variable. Factor analysis was utilized to extract the each underlying dimensions of perception. Pearson correlation analysis was employed to test whether four hypotheses could be supported. Cluster analysis was used to segment the respondents into group of different WTP value

Factor loading was used in order to assess the reliability of questions. Factor loading is a form of construct validity which is gained by factor analysis. All factor loadings exceed 0.60, the minimum requirement for confirming the convergent validity of the construct (Anderson and Garbing, 1988). In order to calculate the reliability of the test, Cronbach's alpha coefficient was used. The calculated reliability coefficient for the variables indicates that the questionnaire is reliable sufficiently. It is necessary to mention that no question because of inappropriate data and not explaining of the associated variable variance was eliminated from the total questions. Cronbach's alpha for all 16 construct were above the recommended reliability level (0.70). Table 2 presents the calculated alpha coefficient and factor loading of the variables.

Table 2 Loadings of indicator variable

Variables	Items	Factor loading	Mean	SD.	Composite reliability (>0.6)	Cronbach' α (>0.7)
Perceived usefulness (PU)	PU 1	0.87	4.27	0.39	0.85	0.83
	PU2	0.83				
	PU3	0.86				
	PU4	0.82				
Perceived Value (PV)	PV1	0.90	4.21	0.37	0.89	0.90
	PV2	0.92				
	PV3	0.86				
	PV4	0.83				
Performance risk (PR)	PR1	0.81	4.44	0.36	0.85	0.84
	PR2	0.85				
	PR3	0.80				
	PR4	0.82				
Financial risk (FR)	FR1	0.94	4.32	0.34	0.91	0.86
	FR2	0.83				
	FR3	0.87				
	FR4	0.82				

A correlation analysis was conducted on all variables to explore the relationship between variables. The bivariate correlation procedure was subject to two tailed test of statistical significance at two different levels highly significant ($p < 0.01$ and significant $p < 0.05$). The results of correlation analysis for all variables are shown Table 3.

Table 3 Correlation matrix for constructed variables

Variables	Perceived usefulness (PU)	Perceived Value (PV)	Performance risk (PR)	Financial risk (FR)
Perceived usefulness (PU)	-	0.45**	-0.59*	-0.65*
Perceived value (PV)		-	-0.68**	-0.36**
Performance risk (PR)			-	0.54**
Financial risk (FR)				-

Note: **, * indicate the statistically significant at 0.01 level and 0.05 level respectively

5. Empirical results and Discussion

5.1 Cloud Usage behavior of SMEs

Various types of SMEs and length of operating business may affect the usage behavior of cloud service differently. A descriptive statistic on usage behavior and the reason that SMEs decided to use the cloud service in their enterprises are presented in Table 4.

Table 4 Cloud usage behavior of the sample

Usage behavior	Number	Percentage
(N=288)		
<i>Type of cloud service commonly used</i>		
Data storage	111	38.5
Website	93	32.3
Server	80	27.8
Information sharing	4	1.4
<i>Main reason of using cloud</i>		
Reducing operation cost	171	59.4
Working Flexibility	70	24.3
Increasing business performance	43	14.9
System Stability	2	0.7
Providing additional/ extra services	2	0.7
<i>Average monthly cost of cloud service</i>		
Less than or equal to 2,000 THB (60 USD)	51	17.7
2,001 - 4,000 THB (61-121 USD)	122	42.4
4,001 - 6,000 THB (122-181 USD)	46	16.0
6,001 - 8,000 THB (182-243 USD)	35	12.2
8,001 - 10,000 THB (243-303USD)	16	5.6
>10,001 THB (>303USD)	18	6.3

Usage behavior	Number	Percentage
<i>Internal influencer of using cloud in enterprise</i>		
Executive director	215	74.7
IT officer/Manager	73	25.3
<i>Buying Channel</i>		
IaaS service provider	174	60.4
Via Internet	94	32.6
Sale representatives/vendors	20	6.9
<i>Additional services needed (possible to answer more than 1 choices)</i>		
Data Storage/Back up service	243	84.4
System security	173	60.1
Networking service	80	27.8
Monitoring	57	19.8

Note: At the time of survey (Jan-June 2015), 33 THB (Thai Baht) was approximately equal to 1USD

Results found that most of the respondents are using cloud computing for data storage (38.5%), followed by website (32.3%), server (27.8%) and information sharing (1.4%). Findings also confirm that main reasons for deciding to use cloud computing of SMEs because they want to reduce their operation cost (59.4%), working flexibility (24.3%) and increase their performance (24.3%).

Most respondents have an average cost per month on cloud service is between 2,001- 4,000 THB or 61-121 USD (42.4%). Executive director play an important role in making decision to implementing cloud service in the enterprise (74.0%). The main buying channel is contacting with IaaS service providers (60.4%) and followed by via Internet (32.6%). Results also indicated that SMEs intend to buy more individual cloud service. Most needed separate cloud service are data service (84.4), followed by the security services (60.1%), network service (27.8%) and monitoring (19.8%) respectively.

5.2 Willingness to Pay (WTP) for cloud service

In order to calculate WTP, two scenarios were designed based on existing packaged that SMEs mostly use as following; 1) System security and 2) Data storage. Ranges of WTP were provided for each service, covering the recommended market price of services and equally divided into 10 smaller price ranges for respondent to choose from. An additional question was added to ask for respondents to write down the exact dollar amount of WTP for chosen service. The findings showed that average WTP for System security was 22.6 USD per month

Table 5 WTPs for cloud services measure by size of enterprises

	Unit: USD/month		
	Small Enterprise (≤50 employee) (n=144)	Medium Enterprise (>50 employee) (n=144)	All (n=288)
WTP for system security	19.78	24.58	22.60
WTP for data storage			
100-300 GB	15.15	17.25	16.20
301-500 GB	18.26	20.75	19.50
>500 GB	20.25	26.25	25.75

This study employed Pearson correlation analysis to test whether four hypotheses (H1-H4) could be supported. Pearson correlation coefficients were presented in Table 6. All hypotheses were supported. Results revealed that perceived usefulness and performance risk were significant in all subgroup. Hence, H1 (perceived value will have a positively relationship to SMEs' WTP for cloud service) and H2 (perceived usefulness will have a positively relationship to SMEs' WTP for cloud service) were full supported.

The perception of service value seemed to have strong positive influence on WTP for cloud service (H1). The implication of significant positive relationship was that SMEs' behavior seemed to be affected by the benefits and costs of using the cloud service. When SMEs obtained more value such as high quality, affordable price and good service, they tended to have relatively high WTP. Similarly, the results of Hypothesis H2 confirmed that SMEs viewed cloud service as a system that increases the working performance of enterprise.

Dimension of performance risk and financial risk measure an extent to which SMEs' expectation if there is uncertainty and adverse consequence of using cloud service. The finding showed that H3 (performance risk will have a negatively relationship to SMEs' WTP for cloud service) and H4 (Financial risk will have a negatively relationship to SMEs' WTP for cloud service) was not totally support in this study. Specifically, the performance risk and financial risk had significant relationship with WTP of SMEs for system security, but these two variables were not statistically significant in all sub group of WTP for data storage. The significant relationship between both risk and WTP was negative as expected, however. These findings revealed that SMEs who felt uncertainty with cloud service, the WTPs would be significant higher.

In addition, the correlation coefficients of performance risk and financial risk were relatively small as compared to perceived usefulness and perceived value. This result indicated that SMEs service value and usefulness are more important for SMEs than performance and financial risk. Marketing strategies emphasizing service value, usefulness could significant increase WTP of SMEs.

However, SMEs remains pay attention more on performance risk if compared to financial risk due to the higher WTPs for both system security and data storage. Also, SMEs that would like to have more data storage, the WTPs might not be significantly increase

Table 6 Pearson correlation coefficients of factors and WTP (USD/month) measures

	Perceived usefulness (PU)	Perceived Value (PV)	Performance risk (PR)	Financial risk (FR)
<i>All respondents</i>				
WTP for system security	0.23**	0.34**	-0.10**	-0.05*
WTP for data storage				
100-300 GB	0.23**	0.31*	-0.15**	-0.14*
301-500 GB	0.15*	0.20**	-0.13*	-0.11*
>500 GB	0.11*	0.14*	-0.08	-0.07
<i>Small Enterprises</i>				
WTP for system security	0.31**	0.16*	-0.14*	-0.12*
WTP for data storage				

	Perceived usefulness (PU)	Perceived Value (PV)	Performance risk (PR)	Financial risk (FR)
100-300 GB	0.24**	0.20**	-0.15*	-0.13*
301-500 GB	0.20*	0.14*	-0.10*	-0.12*
>500 GB	0.19*	0.10*	-0.08	-0.06
<i>Medium Enterprises</i>				
WTP for system security	0.32**	0.25**	-0.18*	-0.15*
WTP for data storage				
100-300 GB	0.21**	0.19*	-0.10*	-0.08*
301-500 GB	0.17*	0.15*	-0.13	-0.06
>500 GB	0.22*	0.11*	-0.09	-0.03

Note: **, * indicate the statistically significant at 0.01 level and 0.05 level respectively

Moreover, cluster analysis was utilized to segment respondent into high-WTP and low-WTP cluster in order to examine how the perception of enterprise affected their WTP for cloud service. WTP measures for system security and data storage were used in clustering. The number of Cubic Clustering Criteria (CCC) of two cluster solution was 54.32. Since CCC was higher than 3, the two clusters solution was considered suitable for grouping respondent into cluster. Table 7 represents the results of clusters analysis. More SMEs were grouped in the first group of high-WTP (173) than those in the second cluster of low-WTP (115). Slightly more SMEs in the high-WTP cluster were medium enterprise (> 50 employees) than those in the low-WTP cluster. Types of businesses in the high-WTP cluster were higher with more than one-half of them with information technology and service. The duration of operated business in two clusters consisted of relatively high percentage of 2-5 years. The WTPs of cloud services were significant higher for SMEs in the high-WTP cluster than those in the low-WTP cluster. For those SMEs in the low-WTP cluster would be willing to pay limited amount money for data storage.

Factor means of perceived value and perceived usefulness for SME in high-WTP cluster were significantly higher than respective factor means in low-WTP cluster. In contrast, performance risk and financial risk for SMEs in high-WTP cluster were significantly lower than factor means in low-WTP cluster. The results revealed that for those SMEs who were more affected by value and usefulness of the cloud service would be willing to pay more for system security and data storage. Moreover, SMEs in the high-WTP have more concern on a perception of risks and it will inversely affect their WTP.

Table 7 Demographic characteristic and WTP measures by clusters

	High-WTP cluster (n=173)	Low-WTP cluster (n=115)	Test	p-value
<i>WTP for system security (USD/month)</i>	30.66	18.63	8.11 ^a	0.00**
<i>WTP for data storage (USD/month)</i>				
100-300 GB	21.35	16.51	5.04 ^a	0.00**
301-500 GB	23.91	19.02	3.86 ^a	0.00**
>500 GB	28.72	25.83	2.73 ^a	0.00**
<i>Factor means(standardized)</i>				
Perceived usefulness (PU)	1.45	0.59	10.07 ^a	0.00**
Perceived value (PV)	1.69	0.83	7.18 ^a	0.00**
Performance risk (PR)	-0.59	0.75	9.54 ^a	0.00**
Financial risk (FR)	-0.46	0.68	11.21 ^a	0.00**
<i>Type of business (%)</i>			45.61 ^b	0.00**
Production	14.62	19.55	-	-
Information Technology	37.28	35.54	-	-
Retailing	12.14	10.29	-	-
Service	15.75	20.81	-	-
Wholesaling	10.20	8.44	-	-
Construction	10.01	5.37	-	-
<i>Number of employees</i>	57.05	42.95	8.13 ^b	0.00**
<i>(% of medium enterprise, >50 employees)</i>				
<i>Duration of operated business (%)</i>			38.30 ^b	0.00*
≤ 2 years	5.43	7.31	-	-
> 2-5 years	70.57	81.25	-	-
> 5-7 years	9.78	10.18	-	-
> 7 years	14.22	1.26	-	-

Note: ^at-test statistics; ^bChi-Square statistics and **, * indicate the statistically significant at 0.01 level and 0.05 level respectively

6. Concluding remark

This study analyzed factor affecting willingness to pay for cloud service of SMEs. The willingness to pay was estimated for system security and data storage to reveal the value SMEs assessed these two commonly used cloud service. Surveys were administered in Bangkok, Thailand during January-June 2015. Respondents were SMEs that used the cloud service.

Results of this study showed that WTPs for cloud service were lower than suggested retail price, indicating that SMEs did not value the cloud service as high as market price. Findings indicated that the perceived value and usefulness had a strong positive impact on willingness to pay, yet the perception of risk both performance risk and financial risk also generated the negative effect.

Respondents were divided into two groups by cluster analysis in order to examine the difference demographic factor of SMEs in their willingness to pay. The cluster analysis confirmed that perceived value and usefulness were important factor both high and low willingness to pay cluster. Moreover, the SMEs in information technology and service business are more likely to have high willingness to pay as compared to others. For those SMEs which have employee more than 50 employees and operated their business between 2-5 years, they had tendency to pay more for cloud services.

The willingness to pay estimation from this study provides some managerial implications. For example, market prices seem to be much higher than SMEs value these two products. However, lowering price may not a sustainable strategy for service providers. Bundling, price discrimination, offering trial period in segmented market would be alternative for service providers. In addition, service providers may need to cooperate with government agency to establish education program in order to emphasize importance of using cloud service. It will also enhance positive perception of SMEs.

This study has some limitations that need to be addressed in the future research .The estimation method of willingness to pay in this study tried to analyze actual rather than hypothetical and the sample size is quite small. Future research may employ others method such as OLS analysis or discrete choice. Moreover, future research problem can be also focused on the usage pattern of SMEs in order to understand the demand of cloud service

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