Exploring Organizational Adoption of Cloud Computing in Singapore[1]

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1. Introduction

The emergence of cloud computing has drastically changed the way information technology (IT) services are used in organizations. When the cost of computing increases due to complex information architecture and infrastructure that deters organizations from employing advanced IT services, the emergence of cloud computing solves the problem by reducing upfront expenses of computing (Marston et al., 2011). Indeed, cloud computing services are extensively used for financial analysis, medical information and diagnoses to online gaming. International Data Corporation (IDC) projects cloud services will outpace traditional IT spending by 2014 (Gens, 2010).

Cloud computing services involve a complex infrastructure of software, hardware, processing and storage integration (Maggiani, 2009). It is a relative new form of computing where scalable, elastic IT capabilities are delivered to customers using the Internet (Plummer, 2009). Clouds are defined as clusters of distributed computers, providing on-demand resources and services over a network, with the scale and reliability of a data center (Grossman, 2009). According to Zhang and Zhou (2009), cloud computing provides an environment to enable resource sharing in terms of scalable infrastructures, middleware and application platforms and value-added business applications. Resources (e.g., CPU and storage) in the cloud model are provided as general utilities that can be leased and released by users through the Internet in an on-demand fashion (Zhang, Cheng & Boutaba, 2010).

For many organizations, the advantages to adopt cloud computing are increasingly appealing as it can add capacities quickly to an IT system without investing in new expensive infrastructure, buying new software, or training new personnel (Gruman, 2008; Yan, 2010). However, adopting cloud computing may also cause organizational risk, such as consumer data protection and privacy, problems with data segregation in the cloud and long-term viability of the cloud computing provider (Brodkin, 2008). In mid 2012, a survey about the future of cloud computing reveals that scalability, business agility, and cost are the top

three drivers for decision makers to adopt the technology, while security inhibits its adoption (Nusca, 2012).

Garner's study finds enterprise's spending on cloud computing is growing faster than overall IT spending and predicts the technology will grow by over 100 percent to become a USD$127 billion industry by 2016 (PRWEB, 2012). A joint IBV/EIU cloud-enabled business model survey also reveals that 62 percent of CIOs consider cloud computing as the leading and important priority for IT (Berman, 2011). Currently, Europe lags behind the US due to regulations on security, integration, performance, and reliability concerns (Berman et al., 2011). Based on a survey in 2010 (DigitalOne, 2010), 59 percent of Asian companies were either using or planning cloud computing, and 23 percent of companies in Singapore had adopted the new technology.

This study aims to examine the status of organizational adoption of cloud computing in Singapore and the factors affecting their adoption. Based on the innovation diffusion theory (Rogers, 2003), organization characteristics (e.g. size, nature, and technological opportunism) and CIOs' and IT managers' perceived characteristics of cloud computing are also investigated. Environmental factors are examined to understand their influence on adoption decisions. In brief, the study hopes to shed light to the understanding of cloud computing in a wide range of business organizations in Singapore; as well as contributing to the knowledge on the factors of adoption. Thus, we hope to mystify the differences between the hype espoused by vendors and providers versus what is really perceived by the organizations.

2. Literature Review
2.1 Cloud computing and adoption

Regarded as an evolving paradigm, cloud computing is defined by U.S. National Institute of Standards and Technology (NIST) as "a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction" (Mell & Grance, 2011, p.2). In other words, cloud computing provides highly scalable subscription-based or pay-per-use services that enable real-time delivery of configurable computing resources (e.g. networks, services, storage, applications, services) over the internet to companies (Berman et al., 2011).

Furht (2010) defines attributes of cloud computing as:

- Scalability and on-demand services: Cloud computing provides resources and services for users on demand. The resources are scalable over data centers.

- User-centric interface: Cloud interfaces are location independent and can be accessed by interfaces like Web services and Internet browsers.

- Guaranteed Quality of Service (QoS): Cloud computed can guarantee QoS for users in terms of hardware/CPU performance, bandwidth, and memory capacity.

- Autonomous system: The cloud computing systems are managed transparently to users. However, software and data inside clouds can be automatically reconfigured and consolidated to a simple platform depending on user's needs.

- Pricing: Cloud computing does not require up-from investment. No capital expenditure is required.

Zhang, Cheng and Boutaba (2010) point out compelling features that make cloud computing appeal to business owners, including:

- No up-front investment: Cloud computing uses a pay-as-you-go pricing model.

- Lowering operating cost: Resources in a cloud environment can be rapidly allocated and de-allocated on demand.

- Highly scalable: Infrastructure providers pool large amount of resources from data centers and make them easily accessible. A service provider can easily expand its service to large scales in order to handle rapid increase in service demand.

- Easy access: Services hosted in the cloud are generally web-based to be easily accessible through various devices with internet connection.

- Reducing business risks and maintenance expenses: By outsourcing the service infrastructure to the cloud, the organization shifts its business risks to the providers, who often have better expertise and equipped for managing these risks.

Essentially, cloud computing consists of applications running remotely 'in the cloud' that reside on personal computers and local servers and leverages on the Internet to provide resources to its users. Cloud computing can be categorized into four deployment models: private cloud, community cloud, public cloud, and hybrid cloud (Mell & Grance, 2011). A public cloud usually means a pay-as-you-go service for the general public, while private cloud refers to a closed internal data centers of a business or organization that is only available to employees and clients. Software as a Service (SaaS)), Platform as a Service (PaaS), Infrastructure as a Service (IaaS) are the three cloud computing service models.

Companies of different sizes, locations, and industries embrace cloud as a way to reduce complexity and costs associated with traditional IT approaches. 72 percent of executives in the IBM survey indicated their companies had piloted, adopted or substantially implemented cloud and 90 percent would adopt cloud computing in the next three year (Berman et al., 2011). More than 31 percent of respondents surveyed cited cloud's ability to reduce fixed IT costs and shift to a "pay as you go" cost structure as a top benefit. Besides,

North Bridge Venture Partners that polled 785 people at 39 high-profile enterprise technology companies found 40 percent of respondents were deploying public clouds and 36 percent were going with a hybrid approach (Nusca, 2012).

Worldwide, cloud computing which is widely recognized as a technology game changer is growing at a rapid rate because cloud computing is beneficial for companies to reduce cost, achieve higher ROI, and increase efficiency (IndustryWeek, 2010). Its capabilities can provide delivery of applications, storage services, and spam filtering which bring a major change to utilize computing resources (Whitney, 2010).

Berman et al., (2011) point out cloud which has potential to drive business innovation can empower six potentially game-changing business enablers: cost flexibility, business scalability, market adaptability, masked complexity, context-driven variability, and ecosystem connectivity. Organizations ought to determine how to employ cloud-enabled business models to promote sustainable competitive advantages in order to transform operations, customer relationships and value chains.

However, security concerns remain the main hurdle for companies to hesitate to switch to cloud computing (PWEB, 2012). There are security risks as sensitive business data are outsourced to third parties for processing. There are numerous issues that make such outsourcing services risky, such as protecting data privacy, problems with data segregation in the cloud, and long-term viability of the cloud computing provider (Brodkin, 2008). Cloud users are vulnerable to security threats from both inside and outside the cloud (Armbrust et al., 2010). In addition, the company will be highly dependent on the cloud connectivity—as once it is lost for whatever reason, all the offsite data may become inaccessible.

Prior studies on cloud computing adoption have addressed areas of new technologies, security requirement and the future expectations in these emerging environments. Misra and Mondal (2010) proposed two business models for companies which are willing to adopt cloud computing services – business models for companies with existing IT infrastructure and business models for startup companies. The changing nature of cloud computing makes it highly suitable for small-medium enterprises (Misra & Mondal, 2010).

Low, Chen and Wu (2011) concluded that cloud computing adoption research is two-fold. First, various factors affecting cloud computing adoption can be classified into technological, organizational and environmental contexts; therefore it is feasible to use the technology-organization-environment (TOE) framework to understand cloud computing adoption. Second, environmental and organizational factors on cloud computing adoption vary across different industry contexts.

2.2 Organizational adoption of innovation

According to Rogers (2003) innovative process, many factors influence the process of organizational adoption and implementation of an innovation, like cloud computing. In the initiation stage, members of the organization prioritize the organizational needs and problems (agenda-setting phase), and thus look for suitable technology to strengthen organizational performance (matching phase) (Roger, 2003). The proposed adoption is evaluated critically from technical, financial and strategic standpoints, after the organization gather and evaluate information about the technological innovation (Thong, 1999). In the implementation stage, the technology is first introduced to the members (clarifying phase). After using it, customized modification of the technology (redefining phase) or adjusting organizational structure (restructuring) will happen to improve the performance. Finally, using technological innovation may become part of the routine practices (Roger, 2003).

Adopting innovation is understood in terms of perceived technological benefits, perceived organizational resources, and perceived environmental pressure. As cloud computing is essentially a type of Electronic Data Interchange (EDI), prior literature show three major factors affecting EDI's adoption in organizations are perceived benefits, organizational readiness, and external pressure (Kuan & Chow, 2000). The three contexts – technological, organizational and environmental (TOE) - may influence the process by which technological innovations are adopted and implemented, especially in small businesses.

2.2.1 Technology context

Technological context refers to internal and external technologies applicable to the firm (Kuan & Chow, 2000). According to Rogers (2003), adopting an innovation is affected by its perceived characteristics, including relative advantage, compatibility, complexity and trialability. Of these, relative advantage of the technology has been consistently identified as one of the most critical adoption factors (Iacovou et al., 1995; Kuan & Chow, 2000). When perceived benefit is high, there are higher chances that the organization will allocate more managerial, financial and technological resources to implement the technological system.

2.2.2 Organizational context

Organizational context includes several indexes regarding firm size and scope, centralization, formalization, and complexity of managerial structure and quality of human resources (Kuan & Chow, 2000). Prior research finds that larger businesses are often more well-equipped with resources and infrastructure to facilitate innovation adoption, while small firms might suffer from resource poverty (Thong, 1999). In Iacovou et al.,'s study (1995) on adopting EDI in small firms, cost of investment and lack of IT expertise are two major concerns among organizational members.

2.2.3 Environmental context

Environmental context refers to a firm's industry, competitors and government policy (Kuan & Chow, 2000). Organizations operate their businesses within an environmental

context which bring them opportunities and constraints. Although the external environment can provide an organization with information, resources and technology, it has regulations and restrictions on the flow of capital and information (Damanpour & Schneider, 2006). Besides, the business environment within which the business operates is of key significance. Competition increases the likelihood of innovation adoption (Thong, 1999) as environmental uncertainty caused by competition helps increase both the need and rate of innovation adoption. Typically, environment factors affecting technological adoption is usually understood as competitive pressure (Iacovou et al., 1995) which is regarded one critical factor for technological adoption in smaller firms.

2.2.4 Technological opportunism

Srinivasan, Lilien and Rangaswamy (2002) defined technological opportunism as an organization's ability to sense and respond to new technologies. Being aware and responsive to emerging technologies allows companies to incorporate technological advancements and thus move steps ahead of their rivals to gain competitive advantage. When a firm is characterized as a higher degree of technological opportunism, it is proactive to innovate itself on a consistent basis. Such firm has the ability, skills and accumulated knowledge to acquire information about technological opportunities and invest resources (Mishra & Agarwal, 2010).

Srinivasan et al. (2002) further identified two components of technological opportunism – technological-sensing capability (i.e. organizational ability to acquire knowledge about and understand new technology developments) and technological-response capability (i.e. organization's willingness and ability to respond to the new technologies it senses in its environment that may affect the organization). However, Chandy and Tellis (1998) reasoned that an organization with good technology-sensing abilities may not be willing to respond to new technologies as they may cannibalize existing products, markets and organizational relationships. Yet, an organization must know how to reengineer its business strategies to exploit the opportunities or stave off the threats posed by the new technology.

3. Research Methodology

Using the TOE framework and Rogers' diffusion of technology, this study conceptualized a research model that incorporates elements from the TOE framework as well as Rogers' diffusion theory to investigate the factors that contribute to cloud computing adoption and the extent of the adoption in Singapore.

RQ1. To what level do Singapore companies adopt cloud computing?

First, this study aims to find out the status of adoption of cloud computing in Singapore and the extent of their adoption (i.e. types of applications, types/layers of solutions, payment model, reasons for non-adoption and future adoption).

RQ2. What are the differences of organizational characteristics between adopters and non-adopters?

Organizational characteristics include attributes of firm size, industry type, IT budget and IT expertise. The firm size plays a key role in determining IT innovation (Pan & Jang, 2008) – large firms tend to adopt more innovations due to greater flexibility and risk-taking ability. IT expertise refers to the technological readiness and IT human resources and infrastructures of a particular firm. Cloud computing services can only be utilized if firms have required infrastructure and technical competence to support the adoption of new technology.

RQ3. How do technology-organization-environment contexts affect the adoption of cloud computing?

In the technology context, this study will look at how adopters and non-adopters differ in their perceived characteristics of cloud computing. They encompass relative advantage, demonstrable results, complexity, and the cloud's compatibility to the firms (Rogers, 2003).

In the organizational context, this study is interested in examining whether adopters and non-adopters show differences in their technology-sensing capability and technology responding capability with respect to the adoption of cloud computing. According to Daft and Weick (1984), an organization that has strong technology-sensing capability will regularly scan for information about new technological opportunities and threats. Strong sensing firms are often one of the first in their industries to notice technological developments that may potentially affect their business (Sarkees, 2009). In addition to sensing disruptive technological changes, organizations ought to be able to act on the knowledge as well, which is technology responding capability. This will require the firms to take proactive investments in product development, manufacturing, marketing and external relationships (ibid, 2009).

In the environmental context, the study analyzes industry pressure which is defined as the level of pressure felt by the firm from competitors within the industry (To & Ngai, 2006; Oliveira & Martins, 2010) as an important determinant of IT adoption (Kuan & Chou, 2001).

The study proposes the following hypotheses:

H1. Perceived technological characteristics of cloud computing are associated with its organizational adoption of cloud computing.

 H1a - Complexity of cloud computing is negatively associated with its adoption.

 H1b - Compatibility of cloud computing is positively associated with its adoption.

 H1c - Relative advantage of cloud computing is positively associated with its adoption

 H1d - Demonstrable result of cloud computing is positively associated with its adoption.

H2. Technological opportunism is positively associated with organizational adoption of cloud computing.

H2a. Technology-sensing capability is positively associated with its adoption.

H2b. Technology-responding capability is positively associated with its adoption.

H3. Perceived industry pressure is positively associated with its organizational adoption of cloud computing.

3.1 Data collection

Based on prior studies (Kuan & Chau, 2001; Rogers, 2003; Srinivasan et al., 2002), the questionnaire developed 23 items measuring components: perceptions characteristics of cloud computing, organization characteristics, and the extent of adopting cloud computing in organization. A 5-point Likert scale ranging from 'strongly agree' to 'strongly disagree' was used to measure the responses.

In mid 2011, the web survey was sent to corporate members of Singapore Chinese Chamber of Commerce and Industry (SCCCI) which encompasses large international business as well as small and medium enterprises. We invited organizational executives (i.e. CEOs, CIOs, or IT managers) who could make the decision to adopt or not adopt the cloud computing to respond to our online questionnaire.

Several statistical tests were utilized to analyze the data obtained from the web survey. To differentiate the technological, organizational and environmental perceptions between organizations who are adopters and non-adopters, independent sample t-test was used. In addition, to answer the study's hypotheses, Spearman's rank order correlation coefficient was used to determine the degree of relationship and magnitude of the study variables. Furthermore, binary logistic regression was used to determine which variables were considered as predictors for the adoption of organizational cloud are computing.

4. Data analysis and findings

A total of 52 executives who could make decision of adopting cloud computing in their companies answered the questionnaire. However, 9 responses were incomplete, thus leaving 43 valid responses for data analysis. In terms of the respondents' profile, 47 percent were middle management level whilst, both the C-level and senior management level each accounted for 23 percent respectively. In terms of the respondents' involvement in decision-making for deploying IT resources, more than half of them are somewhat involved or even heavily involved, but about 19 percent was not involved at all. Besides, the respondents have the following IT expertise: database administrators (8); IT infrastructure (3), IT security (11), software development (3), others (11), with only 7 not having any specific IT skills.

4.1. Organizational characteristics & adoption of cloud computing

The results revealed that 24 organizations (56 percent) have adopted cloud computing, while 19 organizations (44 percent) have not adopted. Figure 1 shows the industry type of adopters and non-adopters of cloud computing. Most adopters are in the media, information and communication industry with 75 percent (9 out of 12 organizations) as well as in the 'others' sector with 59 percent (10 out of 17 organizations). It appears that those organisations in the construction and engineering and real estate and leasing services have not adopted cloud computing services yet.
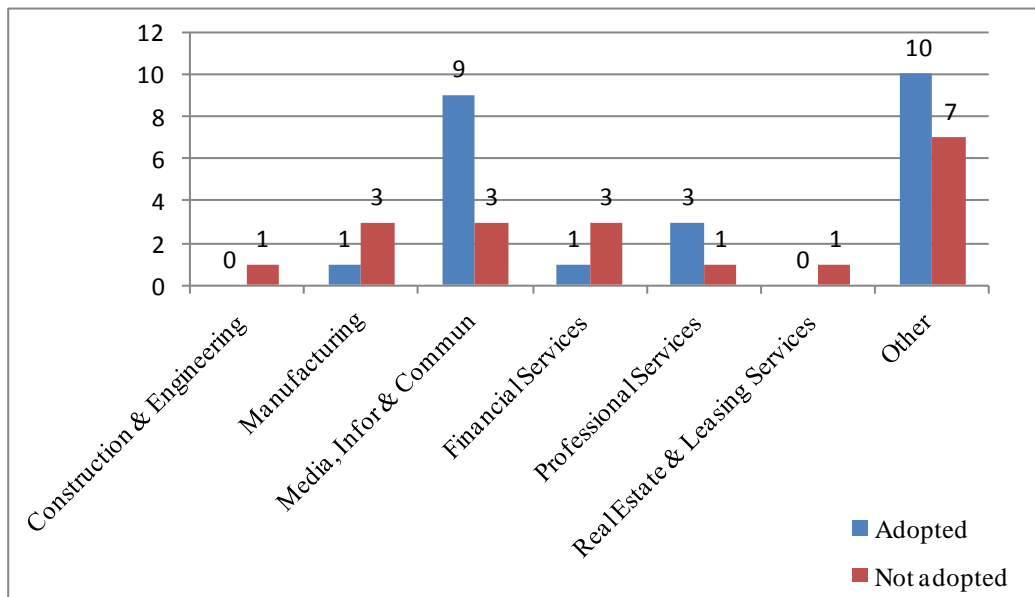

Figure 1. Adoption and non adoption by industry type

Figure 2 shows the adoption and non-adoption by ownership type. It shows that there is no significant difference between adopter and non-adopters in the private sectors and sole-proprietorship or family-owned business, although there are more adopters (63 percent) versus non-adopters (37 percent) in the public listed organizations.

Figure 2. Adoption and non adoption by ownership type

In terms of the firm size based on the number of employees, the results in Figure 3 show that 57 percent of the organization adopt cloud computing, and 43 percent of these organization do not adopt cloud computing. The adoption clustered around the organizations with more than 500 employees (30 percent) and those with fewer than 20 employees (12 percent).
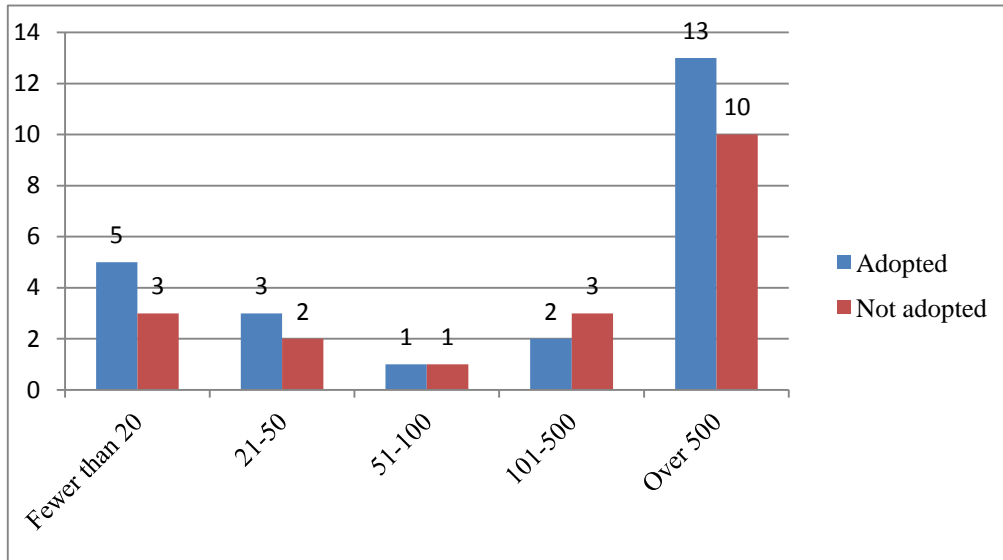

Figure 3. Adoption and non adoption by number of employees

Again in terms of firm size but based on annual revenue, Figure 4 shows the status of adoption rests with two groups, one group of organizations with 'less than $1 million' of annual revenue (23 percent) and the other group with 'more than $10 million' (51 percent).
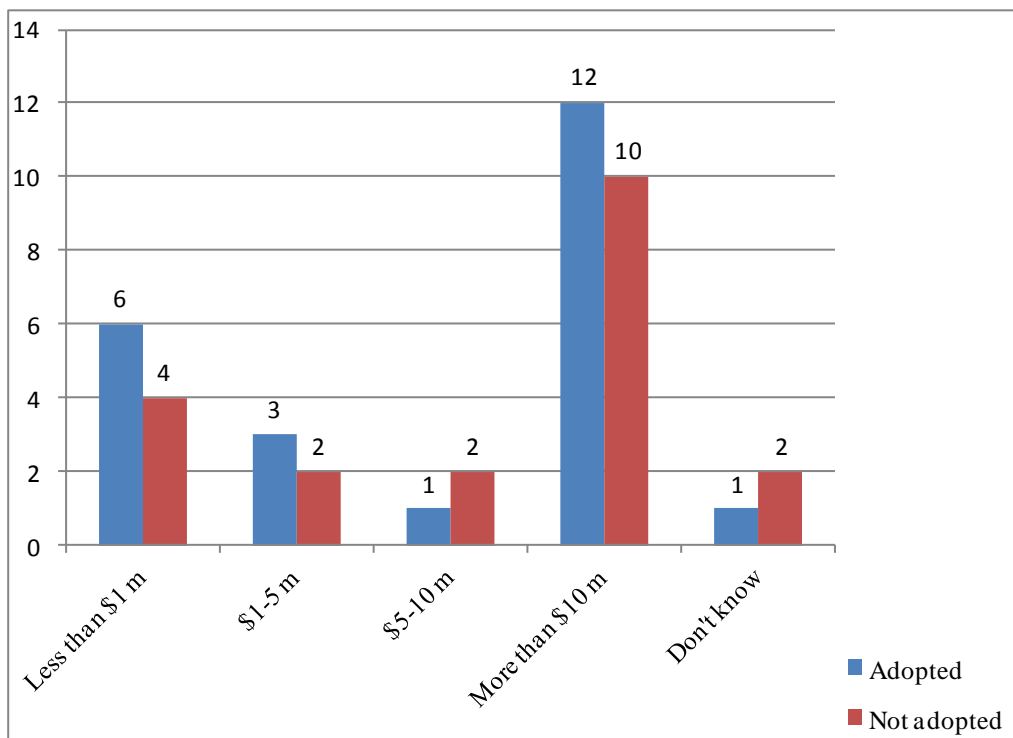
Figure 4. Adoption and non adoption by annual revenue

Figure 5 shows the status of adoption in terms of IT budget. It appears that the organizations with a bigger IT budget (over $500K) adopt cloud computing most, followed by those with the smallest IT budget (<100K).
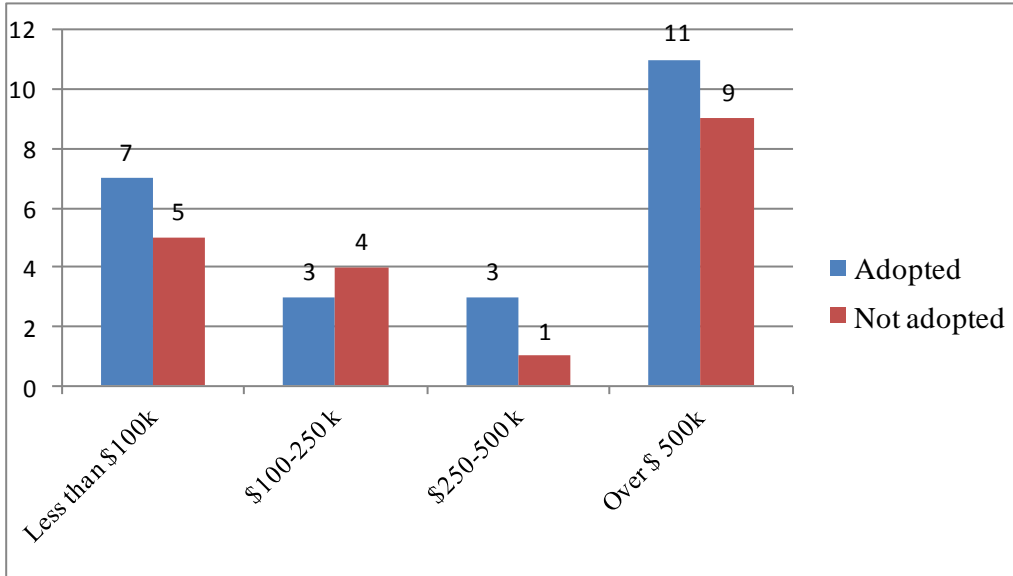

Figure 5. Adoption and non adoption by IT budget

The results also show more companies which have IT department adopt cloud computing (Figure 6).
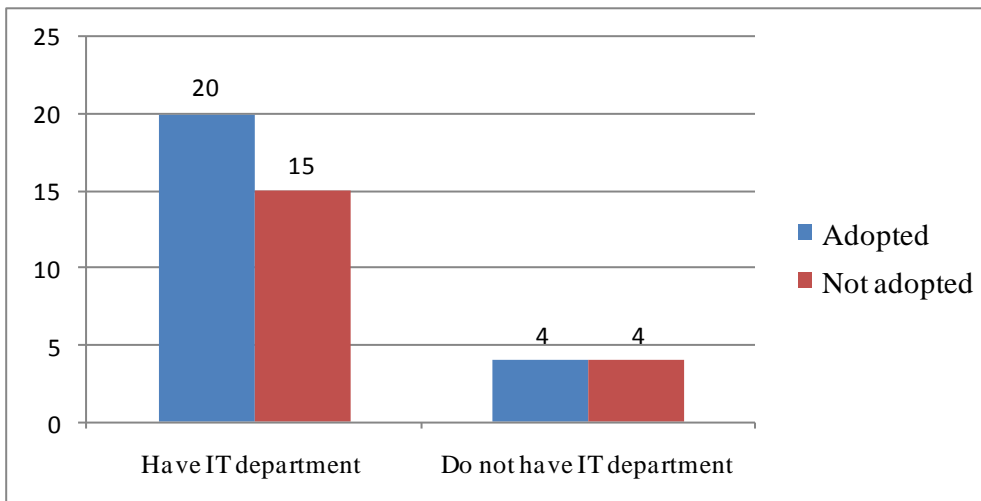

Figure 6. Adoption and non adoption by IT departments

The companies with more than 50 IT headcount tend to adopt cloud computing compared to those with fewer than 50 IT employees (see Figure 7).

For those companies which have not adopted cloud computing, when asked when they plan to adopt cloud computing, almost all of the participants (79 percent) have no idea. Only two participants plan to adopt cloud computing in more than 6 months or 1 year later while the other two said they will adopt 1 year later.

In brief, there is also no obvious influence of firm size on cloud adoption. Neither is there any influence in terms of IT budget, IT expertise as well as the size of the IT department.
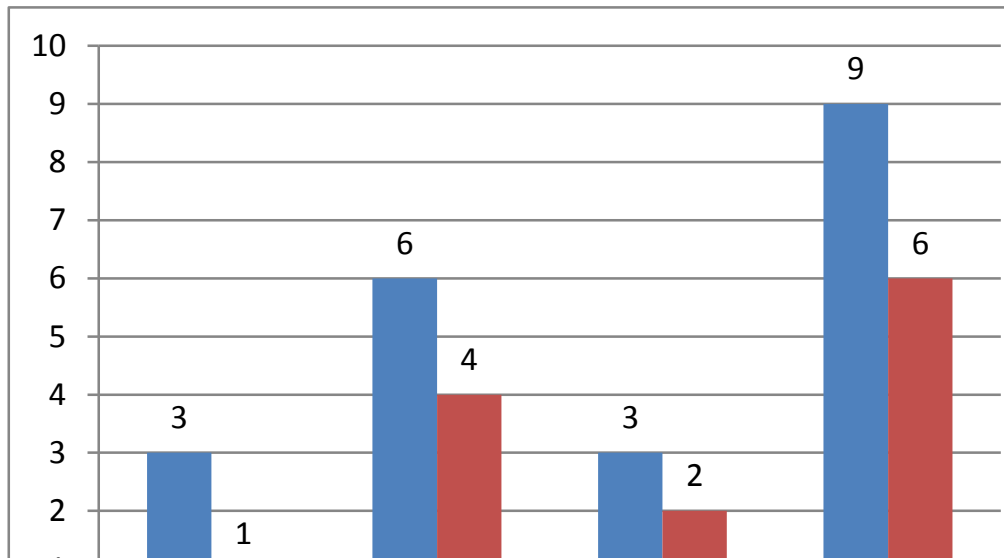

Figure 7. Adoption and non adoption in terms of size of IT department

4.2 Singapore companies' status & extent of cloud computing adoption

In terms of RQ2 on the status and level of Singapore companies adopting cloud computing, and considering that companies would have adopted more than one solution, the results show that private cloud has the biggest share with 35 percent, public and partner cloud with 24 percent for each adoption, followed by federation of cloud (12 percent). In terms of the layers of adoption, the results show that software as a service (SaaS) is popular with 31 percent, followed by applications as a service (AaaS) with 25 percent, Infrastructure as a service (IaaS), 23 percent, Platform as a service (Paaf) with 19 percent and others with 2 percent.

Figure 8 shows the types of application adopted by organizations. The most popular applications used is 'Customer Relationship Management" and least used is the 'Inventory' system. By contrast, for those who plan to use, it appears that 'Customer Relationship Management' and 'Financial' systems are not their priority. However, Document Management seems to be a priority.
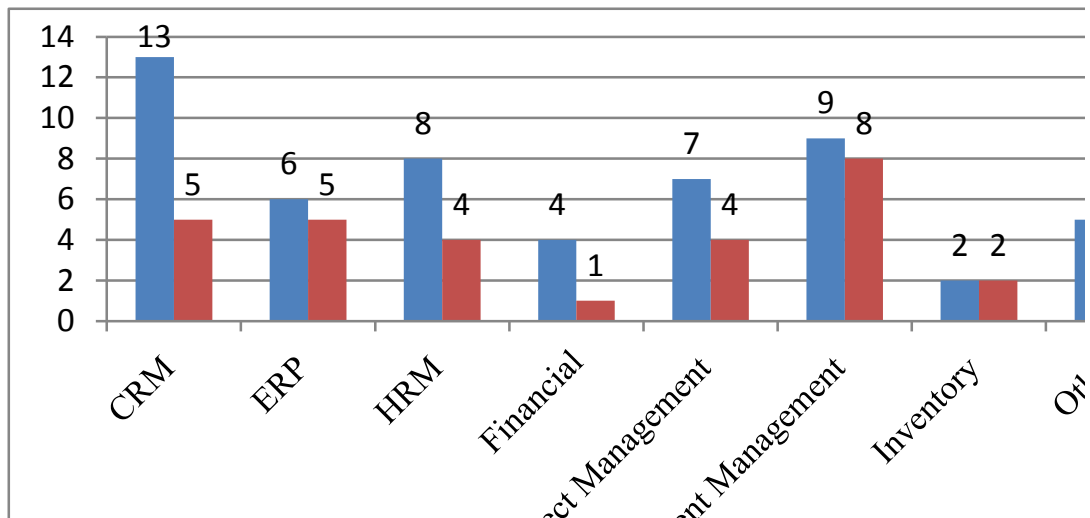
Figure 8. Types of Cloud Computing Applications

When asking the most suitable payment of method for cloud computing services, 40 percent chose 'pay per user license', followed by 'pay per duration' with 27 percent and 'one-time payment for unlimited usage' with 23 percent. Surprising, the least preferred payment method is 'pay per transaction' with 7 percent (See Figure 9)
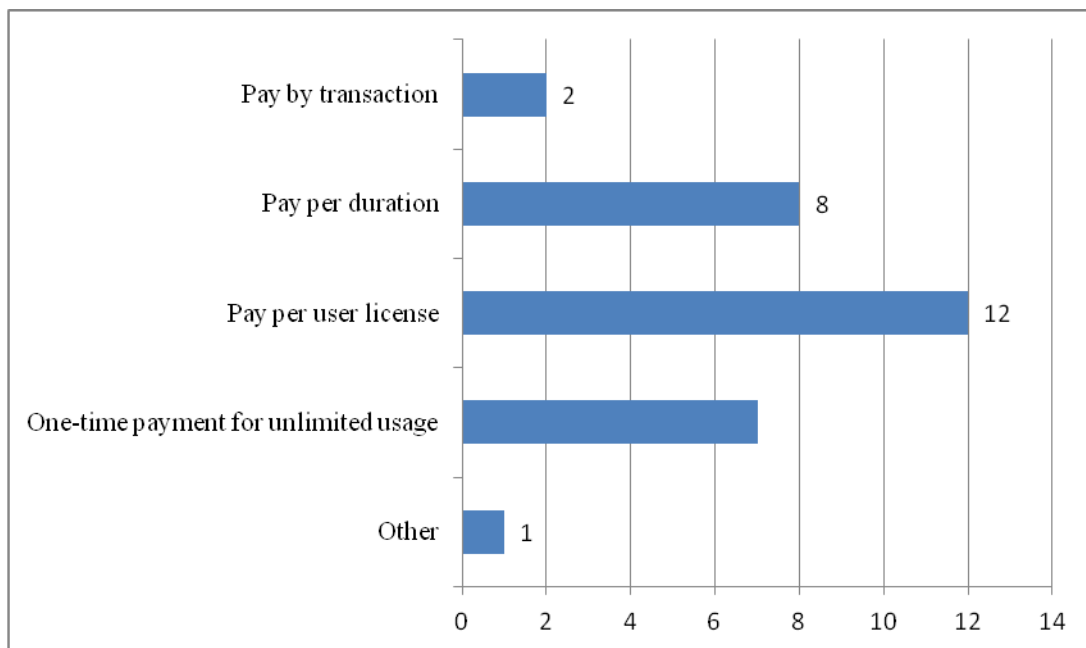

Figure 9. Payment scheme for cloud computing

Figure 10 shows the difference in the average Likert scores of adopters and non-adopters when asked about the advantages of cloud computing. Generally, adopters tend to have higher positive perceptions on the advantages of cloud computing as compared to non-adopters.
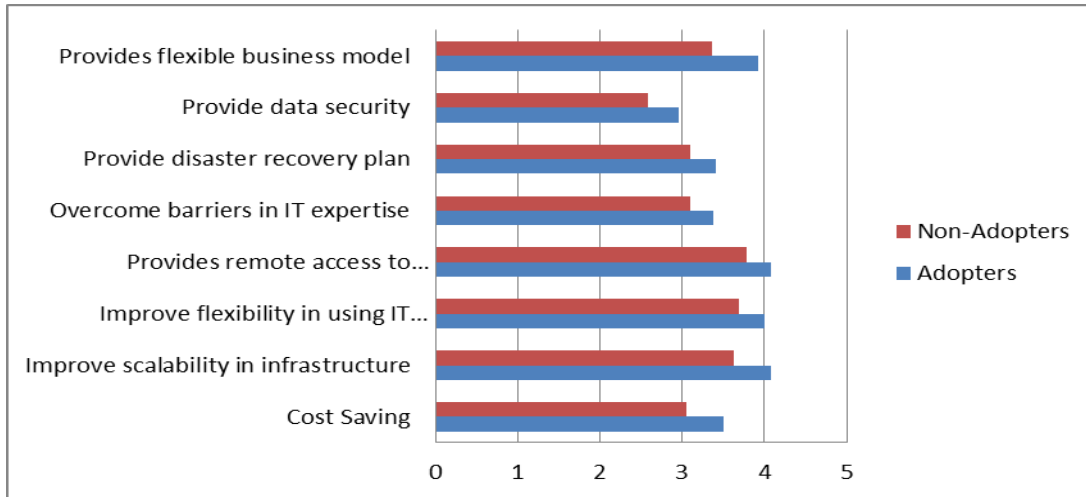
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Figure 10. Advantages of cloud computing

In terms of the reasons why they have not adopted cloud computing, as it is shown in Figure 11, "security issues" is the most important concern followed by as cloud computing is a relatively new information technology.

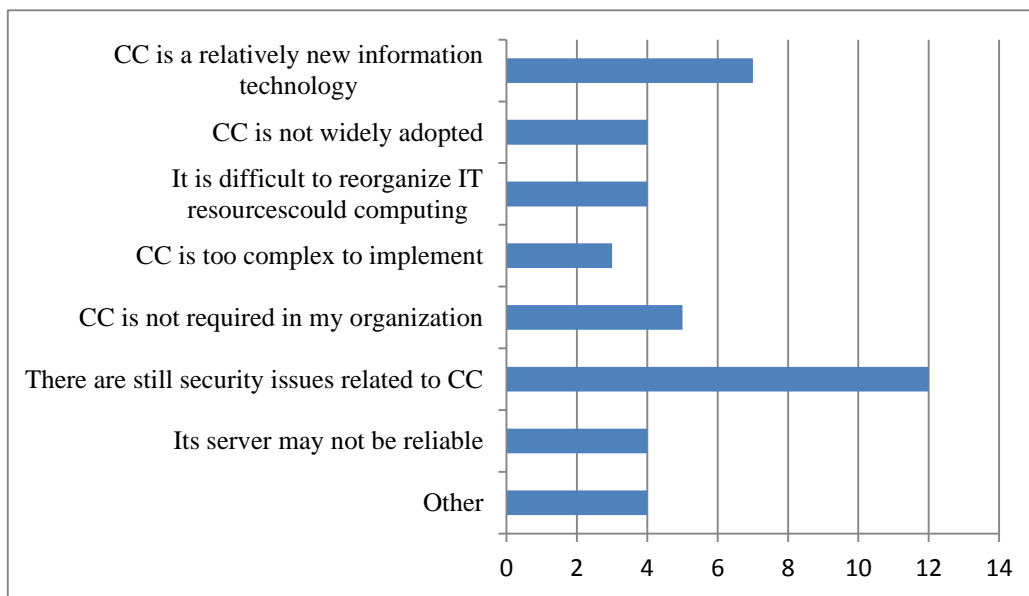Figure 11. Reasons for non-adoption of cloud computing

In summary, it appears that cloud computing is still relatively untapped by Singapore organizations as only slightly over 50 percent of the surveyed organizations have adopted cloud computing. Although there are many advantages to the adoption, it appears that most organizations are still not confident of how cloud computing can benefit their organizations.

4.3. Technology-organization-environment contexts & adoption of cloud computing

In terms of RQ3 regarding how the perceived technology-organization-environment contexts of cloud computing influence the adoption or non-adoption of cloud computing, Table 1 shows the results of T-test between adopters and non-adopters in terms of three contexts of organizational adoption of cloud computing: (1) technology context (i.e. perceived complexity, compatible, relative advantage, and demonstrable results of cloud computing), (2) organizational context (i.e. technological opportunism) and (3) environmental context (i.e. perceived industry pressure). Although prior studies show adopters have higher positive perceptions of cloud computing in three contexts as compared to non-adopters, it is important to take note that statistically significant differences were only found between the variables of perceived higher relative advantage ($p=0.005$), technology – sensing capability ($p=0.072$) and perceived industry pressure ($p=0.003$). The results suggest that the three variables may play an important role to specifically differentiate adopters and non-adopters of organizational cloud computing.

Table 1 Perceived technology-organization-environment variables and t-test between adopters and non-adopters

Variable	Adopters N = 24 Mean (SD)	Non-adopters N = 19 Mean (SD)	p
Technology context			
Complexity	2.73 (0.53)	2.53 (0.61)	0.239
Compatibility	3.46 (0.71)	3.32 (0.95)	0.557
Relative Advantage	3.62 (0.50)	3.11 (0.66)	0.005**
Demonstrable Results	3.12 (0.52)	2.89 (0.66)	0.214
Organizational context			
Technology – sensing capability	3.38 (0.98)	2.79 (1.18)	0.072*
Technology – response capability	2.85 (0.46)	2.68 (0.75)	0.376
Environmental Context			
Perceived Industry Pressure	3.15 (0.73)	2.42 (0.84)	0.003**

** p < 0.01   * p < 0.10

Table 2 shows the results of the Spearman's rank order correlation coefficient. The test was performed to determine the study variables' direction and strength of associations to adoption to organizational cloud computing. From the table, positive correlations were found between perceived industry pressure ($r_s=0.444$, $p=0.002$), relative advantage ($r_s=0.417$, $p=0.004$) and technology – sensing capability ($r_s=0.264$, $p=0.080$). Though positive correlations were found between the three significant variables, the strength of positive relationship is moderate for perceived industry pressure and relative advantage while a weak positive relationship is observed for technology – sensing capability.

Table 2 Correlations of perceived TOE variables to adoption of cloud computing

Variable	Correlation Coefficient	p
Technology context		
Complexity	0.153	0.316
Compatibility	0.019	0.901
Relative Advantage	0.417**	0.004
Demonstrable Results	0.165	0.278
Organizational context		
Technology – sensing capability	0.264*	0.080
Technology – response capability	0.085	0.579
Environmental Context		
Perceived Industry Pressure	0.444**	0.002

** $p < 0.01$ * $p < 0.10$

Table 3 shows the result of the binary logistic regression. Its purpose is to determine which among the variables may be considered as predictors for organizational adoption of cloud computing. Prior to the interpretation of its results, it is important to note that the regression analysis satisfies the Hosmer & Lemeshow goodness-of-fit test since the obtained p value is >0.05 (p=0.572). Further, the regression has a structural model of 71.1 percent which indicates a high probability that the model will correctly predict the cases in the study.

The results shows that relative advantage *(B=1.839, p=0.058)* and perceived industry pressure *(B=1.389, p=0.022)* were considered to be predictors in the adoption of cloud computing. The results also shows that the odds of adopting cloud computing are 6 times higher when an organizations' perception of its relative advantage is taken into account while it is 4 times higher when perceived industry pressure is also observed.

Table 3 Logistic regression of perceived TOE variables to adoption of cloud computing

Predictor	B	SE B	Wald's X^2	df	p	Odds Ratio
Constant	-13.544	6.155	4.843	1	0.028	0
Technology context						
Complexity	0.320	0.783	0.166	1	0.683	1.377
Compatibility	0.354	0.527	0.451	1	0.502	1.425
Relative Advantage	1.839	0.972	3.581	1	0.058*	6.291
Demonstrable Results	0.551	0.919	0.359	1	0.549	1.735
Organizational context						
Technology – sensing	-0.300	0.449	0.445	1	0.505	0.741

	B	S.E.	Wald	df	Sig.	Exp(B)
capability						
Technology – response capability	-0.145	0.875	0.028	1	0.868	0.865
Environmental Context						
Perceived Industry Pressure	1.389	0.604	5.283	1	0.022**	4.009

Test	X^2	df	*p*
Goodness-of-fit test			
Hosmer & Lemeshow	5.724	7	0.572

*** $p < 0.05$ * $p < 0.10$*

Note. Structural model percentage = 71.1%. -2 Log likelihood = 44.351a. Cox & Snell R2 = 0.314. Nagelkerke R2 = 0.422. All statistics reported herein use 3 decimal places in order to maintain statistical precission. NA = not applicable

In RQ3, the findings indicate that relative advantage, technology-sensing capability and perceived industry pressure were positively associated to adoption of organizational cloud computing as such that only H1c, H2a and H3 were supported. Among the three supported hypotheses, the variables named relative advantage and perceived industry pressure were found to be predictors for adopting cloud computing.

Table 4 Summary of hypothesis results

Hypotheses	Correlation Coefficient	Supported	*B*	Predictor
H1a. Complexity of cloud computing is negatively associated with its organizational adoption.	0.153	No	0.320	No
H1b. Compatibility of cloud computing is positively associated with its organizational adoption.	0.019	No	0.354	No
H1c. Relative advantage of cloud computing is positively associated with its organizational adoption.	0.417***	Yes	1.839*	Yes
H1d. Demonstrable results of cloud computing are positively associated with its organizational adoption.	0.165	No	0.551	No
H2a. Technology – sensing capability is positively associated with adoption of cloud computing.	0.264*	Yes	-0.300	No

H2b. Technology – responding capability is positively associated with adoption of cloud computing.	0.085	No	-0.145	No
H3. Perceived industry pressure is positively associated with its adoption of cloud computing.	0.444***	Yes	1.389**	Yes

***p < 0.01 ** *p < 0.05   * p < 0.10*

Conclusion

   Singapore is the third most ready country for cloud computing in the Asia Pacific region. The Singapore government has recently implemented a pro-innovative scheme that allows firms adopting cloud computing get a 400 percent tax deduction (Lim, 2011). More and more firms are beginning to migrate to cloud platforms. Thus we are motivated to examine the status of organizational adoption of cloud computing in Singapore and the factors affecting their adoption so as to understand its adoption in the wide range of business organizations.

   Our findings show that the adoption of such emerging technologies is still in its early days amongst the organizations in Singapore that we surveyed. However, it is interesting to note that in the study, the findings showed that factors such as organizational technology-sensing capability, perceived relative advantage as well as perceived industry pressure are seen positively on its adoption, in fact, as a predictor of cloud computing adoption.

   As this study is preliminary, and considering the small size, we would like to suggest more research be done to investigate on the adoption of cloud computing amongst the different types of organizations.

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