Cloud Services Adoption: An Exploratory Investigation

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ABSTRACT

Cloud computing enables customers to rent IT when needed. From technology's point of view, the advent of cloud computing finally makes the long-held idea of computing as a utility to be realized. However, from business' perspective, the acceptance of cloud computing depends not only on the technology availability, but more on the business readiness. A systematic approach to evaluate the business value of adopting cloud services for potential users is needed. Following Diffusion of innovation theory, and by interviewing five companies, we identified three important factors and one moderating variable that may influence firms' intention of adopting cloud services. We then collected data from 200 firms to examine the validity of the proposed model. Our findings indicate that perceived benefits and business concerns are the primary two factors when a firm evaluates its cloud adoption. Nevertheless, environment pressure from trading partners becomes the main driver to their final adoption.

Keywords: IT services; Service adoption; Innovation adoption; Cloud computing

INTRODUCTION

Cloud computing is a new technology concept that delivers IT services as computing utilities. It evolves from distributed computing, grid computing, virtualization technology, and more recently, service oriented architecture (SOA). Cloud computing business model is one that customers can rent IT infrastructure, platform, and software services in the cloud when needed.   Cloud clients do not need to purchase too many IT infrastructures (hardware, software, IT employees etc.) in order to run their business. Instead, they can deploy their business applications, store data, and run analysis on the cloud via the Internet connection on a pay-per-use basis [1]. Thus, cloud services reduce information technology overhead for end-users, provide on-demand services with great flexibility, and most importantly, lower total costs of ownership [3].

With the alluring benefits, more and more companies are considering or have embraced cloud services as part of their IT solutions. However, as the visions and hypes of cloud computing are popularly discussed, many technical and business concerns of cloud computing gradually emerge. For example, service outage, IT security concern, data leak, vendor lock-in, performance unpredictability, data transfer bottlenecks, and many others [1]. Is cloud computing a profitable business model or just a new technology concept?

The answer of the above question depends on how CIOs and IT managers make a tradeoff between the various benefits and concerns of cloud computing when they decide on their IT solutions. Moreover, a firm's characteristics such as size, IT capability, and core businesses may also moderate the impacts of the benefits and concerns of cloud computing. Adopting cloud or not is a complicated decision, and currently, there is no systematic framework to assist the IT people to make the decision. Therefore, this study attempts to provide a more organized and integrated framework to simultaneously evaluate the benefits, concerns, environment and firm's own IT resources as a moderator of adopting cloud computing for potential users. As cloud computing is still in its early age, our exploratory based study proposes a framework by interviewing five cloud using companies or potential users in Taiwan, and validate the framework by collecting 200 firms. To have a solid guide to conduct the research, we use Diffusion of innovation (DOI) theory as the research foundation.

LITERATURE REVIEW

Rogers' Diffusion of innovation (DOI) theory is the most used theory when investigating IT innovation adoption [13]. This study also applies DOI's point of view as our research foundation. DOI theory is concerned with the way that a new technological idea, artifact or technique, progresses from creation to use. It purports to describe the patterns of adoption, explain the mechanism of diffusion, and assist in predicting whether and how a new invention will be successful. Rogers' diffusion of innovation theory posits that Innovation Characteristics will affect innovation adoption. Factors within the Innovation Characteristics category are the "perceived attributes of the innovation" that either encourage (e.g., relative advantage) or inhibit (e.g. complexity) innovation use. Rogers indicated that five attributes of an innovation (relative advantage, compatibility, complexity, trialability, and observability) can explain 49 to 87% of the variance in rate of adoption.

Although Rogers' diffusion of innovation theory appears to be most applicable to investigate innovation use, researchers still keep searching other contexts influencing organizational innovativeness and combine them with Rogers' diffusion of innovation theory to provide richer and potentially more explanatory models. A new and important component – Environmental context – is added into the framework by Tornatzky and Fleisher (1990) [14]. The Environment context is the arena in which a firm conducts its business – its industry, competitors, and dealings with government. The environment presents both constraints and opportunities for technological innovation. For example, external pressures from customer or competitors in the environment plays a very important role in innovation adoption [5].

The Thirteenth International Conference on Electronic Business, Singapore, December 1-4, 2013

The DOI theory has been applied to examine various technology adoption issues in order to distinguish adopters from non-adopters. Zhu et al. (2006) [16] empirically examined some DOI factors (i.e., technology readiness, technology integration, firm size, global scope, managerial obstacles, competition intensity, and regulatory environment) that have strong influence on three different stages of e-Business assimilation at the firm level. Kuan and Chau (2001) [9] reported that perceived direct benefits, perceived financial cost, perceived technical competence, and perceived industry and governmental pressure have significant influence on EDI adoption in small businesses. Pan and Jang (2008) [11] applied the DOI theory to examine the relationship and influence of ERP adoption with the results indicating that technology readiness, size, perceived barriers, and production and operations improvements are important determinants. Venkatesh and Bala (2012) [15] proposed that DOI factors influence IT-enabled inter-organizational business process standards (IBPS) and found that two factors—expected benefits and relational trust— had direct effects on IBPS adoption.

Reviewing past studies that empirically tested DOI theory, we found that perceived benefits   offer by an IT innovation is the most common factor that was found to influence a firm's decision to adopt innovations [6]. Therefore, we include perceived benefits of cloud computing as the first factor into our model. In contrast to the benefits of using cloud, several factors that may inhibit firms to adopt cloud services are also identified and are combined as the second factor called business concern in our study. These inhibitors are proposed by many IT experts who believe them to play a big role in the acceptance of cloud services [6]. Lastly, as previous research in DOI suggests that small firms' decision on rather to adopt a new IT is primarily based on their business partners' requests [2, 7, 8], we include Environment factor which   comprises of external pressure from business partners and some general environment issues as a third factor in our framework. In summary, three categories of factors are used in forming our research framework including: (1) Perceived Benefits, (2) Business Concerns, and (3) Environment. In the following, we applied these factors into cloud computing context and explain them in detail.

Perceived Benefits of Could Services:
Reviewing literature, we found there are four dimensions of perceived benefits of cloud services [1, 10, 12].

- Costs Decrease: Costs are claimed to be greatly reduced as fixed costs (hardware, software, etc.) are converted to operational expenditures (rent) when using cloud services. The pay-as–you-go manner in cloud computing significantly lowers IT infrastructure costs, barriers to entry, and fewer IT skills are required for implementation.
- Flexibility and Scalability: IT departments does not need to purchase additional hardware and software when they anticipate an increasing user load if using cloud computing. A cloud service user firm can add and reduce its IT capacity as its business transaction volume fluctuates. During peak times or holiday seasons, cloud services can provide additional computing power quickly and easily to process increasing customers' visits.   The flexibility and scalability are what firms always wish to have.
- Easy Implementation/Upgrade/Maintain: Without the need to purchase hardware/ software, to implement, to maintain or to upgrade any in house IT systems, a company using cloud computing can receive its IT services within the least possible wait time. The firms don't need to hire too many IT professionals to operate IT systems either.
- Mobility: Employees can access information wherever they are, rather than having to remain at their desks.

Business Concerns of Cloud Computing:
Many IT scholars and practitioners have attempted to identify the potential concerns of using cloud services [1, 10, 12]. These can be grouped into the following five groups:

- Service Availability/Outage Risks: Firms worry most about whether cloud services will have non-failure availability, just as individuals concern about the reliability of general utility services (electricity, water, gas, etc.). These utility services are accessed so frequently that they need to be available to the consumers at any time. Large companies especially, will be reluctant to migrate to cloud computing if their business continuity can not be assured.
- Vendor Lock-In/Data confidentiality: Concerns about the difficulties of extracting data from one cloud provider to another, or from cloud computing back to firms own IT systems is preventing many firms from adopting cloud services. Firms care about the interoperability among platforms as they don't want to see data lock-in problem. Firms want to assure that the standardization and compatibility could enable them deploy data and analysis across multiple cloud providers. Furthermore, firms always have security concerns of putting their sensitive corporate data in the cloud. The concern of data confidentiality could limit cloud computing's desirability.
- Data Transfer Bottlenecks: Since firms have to send a lot of data back and forth between the clouds and their own companies, data traffic bottlenecks would be an important issue. Data backup and data archive are common data-intensive activities that firms   do in their daily businesses. While companies can save money on equipment and software with cloud computing, they could incur higher network bandwidth charges from their service providers. Checking Amazon's cloud computing price scheme, we found network bandwidth charges indeed is a big concern.
- Unpredictable Functionality: Firms can customize their in-house IT systems to fit their business processes and needs. However, since cloud computing is a utility service, it may not provide the same level of customization. Cloud providers generally don't design platforms to support specific companies' IT and business practices. The concern of losing control of the system functionality and performance may inhibit firm's willingness to adoption of cloud computing service.

- Incident management/Service Level Agreement: Many firms indicate that they would worry tremendously if incidents happen when using cloud computing. They would feel extremely nervous if their cloud vendors cannot provide them with efficient communication channels to report the incidents. They also feel anxious if they don't know how much recovery time is needed to solve the incidents. In service industry, it's hard to measure service quality, service performance, or service providers' capability in solving incidents, and the same difficulty exists in delivering IT services from cloud computing.

Environment:

There are two dimensions in Environment construct.

- Environment Pressure: Environment pressure refers to (1) competitive pressure from rivals and (2) business partners' pressure from focal firm's suppliers or customers. Among them, imposed pressure from business partners is expected to be one of the most critical factors for IT adoption by small firms [6]. Once a firm's important business partners (customers and supplier) have adopt cloud computing, it usually will request the focal firm to adopt to integrate their IT solutions. Also, when most of the rivals of the focal firm have adopt cloud computing, the peer pressure will also have some influence on the focal firm.
- Environment Readiness: First, economic climate downturn will boost cloud computing's appeal, particularly to small companies with limited resource for IT investment. Cloud computing is a solution for small and midsize companies to outsource their IT completely. Second, from previous experience, government promotion or subsidy is another factor that influences the adoption of innovations. Third, the infrastructure including regulation completeness and IT quality are also important factors affect a firm's willingness of adopting cloud services. In short, when firms feel more environment readied (economically, subsidy wise, regulation wise, infrastructure wise etc.), they would be more likely to adopt cloud services.

RESEARCH MODEL AND PROPOSITIONS

The abovementioned three categories of factors in the literature are formed into a framework to simultaneously evaluate a firm's intention of adopting cloud computing (Figure 1). The related propositions are listed in the following.
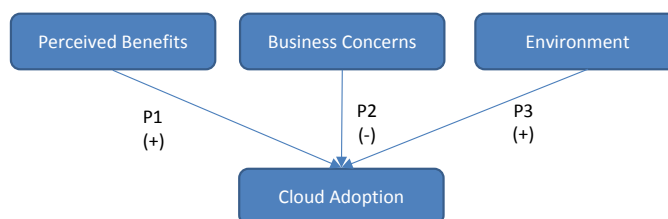

Fig 1. Research Model

Proposition 1: Firms perceive more cloud benefits are more likely to adopt cloud services.
Proposition 2: Firms with more business concerns are less likely to adopt cloud services.
Proposition 3: Firms feel more environment pressure and readiness are more likely to adopt cloud services.

METHODOLOGY

To rigorously test the proposed research model and propositions mentioned above, we investigated five companies using both qualitative (in-depth interview) and quantitative (questionnaire) research methods to understand what are the firms' intentions in adopting cloud services. Since cloud computing is still in its early stage, an exploratory study using both qualitative and quantitative research methods would be especially appreciated because such research methods can provide different aspects of information to uncover the cloud block box.

The five companies that we investigated are start-ups at the Center of Innovative Incubator in two universities in Taiwan. The objective of these incubators is to assist and facilitate the business success of Small and Medium Enterprises (SMEs) with university resources (such as IT facility and other infrastructure). The reason we chose the five star-ups instead of other large firms as our subjects is because we believe cloud computing is more likely to be adopted by small and medium firms with very limited IT resources first. Cloud computing provides SMEs with very low cost and affordable IT services. Besides, SMEs usually have less concern for using cloud computing as their businesses are still young and less complex comparing to large firms. Therefore, the five start-ups are very good candidates to investigate.

During our investigation, top managers (CEO, CIO, etc.) from the five chosen firms were invited to fill in a questionnaire and then face-to-face structured interviews were conducted at their available time. The face-to-face interviews clarified some crucial points the respondents expressed in the questionnaires. Afterwards, telephone or email confirmation with these top

managers was executed if necessary. All interviews were recorded with voice recorder, and were transferred to transcripts before further discussion. The company profiles of the five start-up companies are listed in Table 1.
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TABLE I.   *COMPANY PROFILES OF THE FIVE START-UPS*

Firm	A	B	C	D	E
Industry	ICT*	ICT	ICT	ICT	ICT
Company type	.COM	.COM (S/W)	H/W	.COM	.COM
Interviewee	CEO	CIO	CEO	Founder	CEO & CIO
Service or Product	e-Pass & e-Ticket	Mobile communication service (Push email)	Network storage devices	Online game community management	Online marketing with facebook platform
Company years	0.5	10	2.5	0.5	2.5
Total Employees	6	20	3	5	20
IT employees	6	10	1	1	10
Revenue (NT$)	<5M	5-10M	10-30M	<5M	<5M
Capital Source	Microsoft	Acer	NA	Founders and Gov.	NA
Customers	enterprises	mobile phone users	System houses	Online game players	enterprises
Current Cloud Adopter	Yes	Yes	No	No	No

*Note: ICT: Information and Communication Technologies industry, S/W: Software company, H/W: Hardware company

Two out of the five companies that we interviewed are cloud users now. The other three companies are non-adopters. However, the three non-adopters indicated that they would be potential cloud adopters under some circumstances. We will use our proposed framework to explain the different cloud adoption level in the following.

Proposed framework using five case studies
Categories of Cloud adopters
The relative importance of perceived benefits, business concerns, and environment in a firm influences different levels of cloud adoption for the firm. Thus, using our proposed research model (Figure 1), we combined the anticipated effects (High, Low) of each factor to formulate a framework serving as cloud adoption typology for businesses (see Table 2). Using the typology, we classified the five firms from our sampling pool into the accordant positions in Figure 2. In the following, we describe and illustrate each cloud adoption type from Table 2 as it applies to the case study firms (firm A, B, C, D, E).

TABLE II.   *FRAMEWORK OF CLOUD ADOPTION*

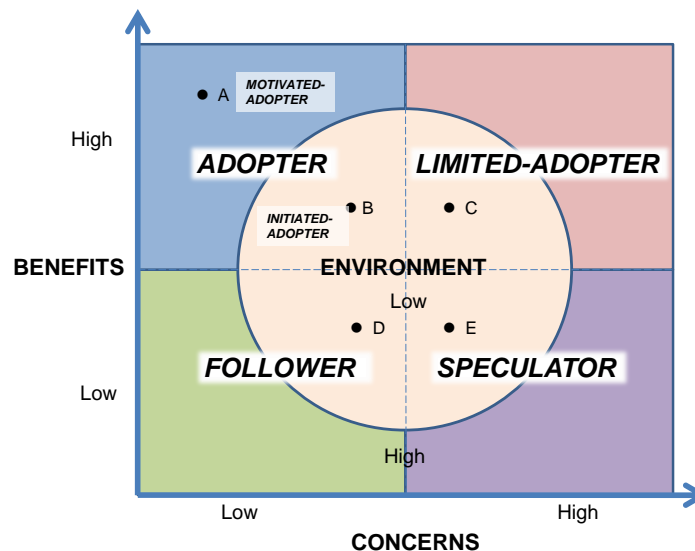| Firm	Perceived Benefits	Business Concerns	Environment
Adopter (Motivated)	High	Low	High
Adopter (Initiated)			Low
Limited Adopter	High	High	High
			Low
Follower	Low	Low	High
			Low
Speculator	Low	High	High
			Low

Figure 2. Typology of Different Cloud Adoption Levels

Adopters (motivated adopters and initiated adopters)

Adopters are firms that perceive high benefits and low business concerns to cloud adoption regardless to external environment. The firms in this category have recognized the relative advantages of cloud services, and their business models are adequate for adopting cloud services with lesser concerns. Top managers of adopters are experienced and are able to make comparisons between a variety of cloud solutions offered by the cloud service vendors. Moreover, the adopter category can be divided into two sub-groups -- motivated adopters and initiated adopters, according to the level of the third factor (i.e. Environment). Firm A and Firm B in the left upper corner in Figure 3 are cloud adopters, both perceived high benefits and are hold less concerns when using cloud service. Though Firm A who perceived higher environment pressure (located outside the circle) is a motivated adopter, while Firm B who perceived less environment pressure (located inside the circle) is an initiated adopter.

Firm A is a motivated adopter who is highly motivated by its trading partner with financial support. A large amount of capital from Microsoft was poured into the company when firm A was launched in January of 2010 without any income. Firm A, an e-Pass and e-Ticket service provider, is a so called dot-com company. The company offers a unique and proprietary cloud services to customers by delivering a two dimension bar code to a customer's mobile phone which acts as a certificate instead of a paper-form ticket when customer purchases a ticket on the Internet for sport games or shows. The only thing that the customer needs to do when s/he arrives at a show or a game is to show the barcode in his/her mobile device to the ticket collector. Firm A provides all of its services on a cloud platform. Firm A's CEO (the interviewee)   told us they perceived high benefits of using cloud services and their business model is suitable for cloud services with limited concerns. Firm A has six employees with strong IT expertise to date. Microsoft, as firm A's big trading partner, provided firm A a cloud operating system –Azure—and charged firm A very little fee. Firm A felt high trading partners pressure (environment pressure) as well as trading partners' support. Therefore it is categorized as a motivated cloud adopter.

Firm B, on the contrary, is categorized as initiated adopters with less capital support from its trading partners than firm A. The company, a mobile phone service provider, offers a proprietary push-mail service to its mobile phone users. Push-mail represents an application delivering email contents to a user's mobile phones. This service is particularly beneficial to business people who travel across nations and are often away from their offices. To develop such an application, IT talents are highly required. However, Firm B only has three IT employees. From CIO's perspective, he tends to delegate the firm's IT talents to core R&D and business instead of management of information systems. Following such thought, firm B adopted an unlimited email solution from ICDSoft (cloud services providers) and abandoned it's own proprietary email system; it adopted Google document for project management and customer service;   Skype for conference meeting, and lastly, Amazon EC2 (cloud services) for their data center. Firm B's decision in adopting cloud solutions is not forced or supported by its business partner, but because it perceives high benefits and has limited concerns for using cloud services. We then categorized it as a cloud initiated adopter.

Limited Adopters

Limited adopters are organizations that are aware of potential benefits of cloud services, but they have much concern in adopting cloud services at the same time. They would adopt cloud services for their non-core business operations in the beginning. By limited adoption, these firms could evaluate their willingness to adopt cloud services in order to get some benefits from cloud services and at the same time, reduce the concerns on their vital business.

Firm C in our sample, though it's not a cloud adopter yet, is likely to become a limited cloud adopter soon. Firm C is a high-tech manufacturing firm run by three people with limited funds, and its level of IT sophistication is very low. Firm C has lots of confidential business data such as material data that needs high IT security. Even though the owner recognized several benefits that cloud services can contribute to his organization (such as cost savings and flexibility), he indicated that data

security and data lock-in problem restrain his firm to adopt cloud services. Despite these concerns, the owner expressed a strong willingness to adopt cloud services on their non-core business operations (such as E-mail and office suite).   The owner argued that only when public key encryption are available and the related confidentiality issues are highly secured   by cloud vendors, he would consider the adoption of cloud services for most of his business operations.

Follower
Followers are small firms that just started their business and have not had enough business volume (transactions). Because of the small business volume, they usually do not have large IT needs, and therefore, they perceive low benefits of using cloud services while they have low business concerns as well. Firm D in our sample is one example of followers who was launched a year ago. It was established by five members and its business model is to provide an online platform for online game players to manage their own communities. Online game companies are also its potential customers who can gain market information to form their marketing strategy from Firm D's database analysis.

At present stage, Firm D is still in its early phase on products/services development and testing. It has not reached to full scale operation yet. Firm D is in need of project development tools, project management, video conference and business communication solutions.   However, due to its limited financial resources, Firm D could only afford free cloud services such as Google sites, Wiki, and second life that make their team members communicate and manage projects with ease. For their full scale operation in the near future, the interviewee explained that they had high interests in using cloud services and would check out the current cloud service providers' solutions along with their customers' requests.

Speculators
Speculators are small firms that are not fully aware of the potential benefits of cloud services and have lots of concerns for adopting cloud services. They will not adopt cloud services immediately. However, they would pay much attention to the latest news of cloud services, and keep an eye on their competitors' pace of using cloud services. The firms in this category are speculating other firms' decisions.
Firm E, a dot-com company, is a speculator that does not recognize the full benefits of adopting cloud services because of its competent IT capability and powerful data center in house. Currently, the data center is able to fulfill the needs of the firm, so it reduces the perceived benefits from cloud services and increases concerns about security. However, the CIO and CEO of Firm E kept mentioning that they would consider adopting cloud services to save costs when they need more people to maintain the data center as its business grow, or when concerns decrease. But most importantly, if their competitors are using cloud, or their customers are requesting cloud, they will adopt cloud soon. The firms in this category are speculating other firms' decision and are waiting for cloud to mature.

Effect of the explanatory factors

Perceived Benefits
In general, cost-saving, scalability/flexibility, and fast deployment, are the main advantages that the five firms all agreed to. One of the reasons could be they are all SMEs struggling for survival, and sufficient cash flow (or cost-saving) is critical to decision-making when an IT investment is evaluated. For example, firm B (an initiated adopter) expressed the concern of huge maintenance costs with traditional IT solution as they encountered IT problems that happened far away from their headquarter. Additionally, firm D (a Follower) stated that cost is their first priority to put into consideration when evaluating cloud solutions. Firm B, D, and E all favor cloud version SMEs IT package, which includes the most common IT functions to support business operation, if it is available. In terms of scalability and fast deployment, four out of the five companies from our sampling pool indicated the significance of time-to-market concept to a SME's competitive advantage, and cloud services can meet the needs much better than traditional IT solutions.

Business Concerns
Generally speaking, we found that cloud service availability, data confidentiality, and incident management are major concerns that the five companies strongly expressed in this study. An unexpected service interruption would lead to chaos of business operations in a company. Such loss is rather difficult to evaluate, and thus cloud service providers' capability of incident management and disaster recovery is highly considered by cloud potential users. In addition, data confidentiality and vendor lock-in are vital to a company in light of customer data, core business operation data, competitive technology, and commercial secrets. Data confidentiality is the top concern to firm C (a limited adopter), and the company admitted that they will adopt cloud solutions for their core businesses only if data encryption technology is well applied. All these firms would consider accept to in-house data back-up in conjunction to data back-up on cloud.

Environment Factors
Our findings indicate that environment readiness (regulation, infrastructure, government subsidy, economy etc.) are less significant comparing to external environment pressure (from trading partners or from competitors). Also, the majority of our respondents expressed that although perceived benefits and business concerns are important variables when evaluating cloud adoption, external pressure is the strongest explanatory factor that influences their final decision. Specifically, we found that external pressure becomes so critical in influencing the limited adopters' and followers' decision of cloud adoption. For

example, firm D, a follower who sees low perceived benefits and concerns, mentioned that it will change its decision-making of IT investment if it receives financial support from trading partners or from government.

Moderating Factor

In our more careful observation from the interviews and questionnaires, we found that except the three main explanatory factors in our model, there might exist one important moderator that is very likely to moderate the relationships between the main factors and the final adoption decision (dependent variable). The possible moderator is "IT resources". IT resources in this research refer to IT capable employees [4] (Figure 3). For the moderating effect of IT resources, we found that part of reasons that firm E chooses to be a speculator instead of an adopter is due to its strong IT resources (ten IT-capable employees), who are capable to manage their in-house data center efficiently and effectively than cloud service providers are. Therefore, the benefits of using cloud services are not strong enough for Firm E, even though they clearly understand the benefits of cloud services. The strong IT resources moderate the relationship between perceived benefits and their intention for adopting cloud [4].
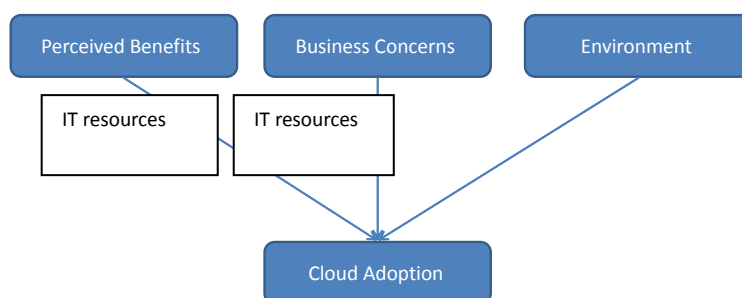

Figure 3 Proposed Moderating Effects

EMPIRICAL RESULTS AND FRAMEWORK VALIDATION

To validate the proposed framework, this study had surveyed enterprises by telephone. Our target firms are public Taiwanese companies, and we reached 200 efficient samples. Respondents must be CIO or IT-related employees from those enterprises which had considered cloud computing solution among their organizations. Besides, 65% samples are from small and medium businesses (SMBs) which have less than 200 employees within their companies and were viewed as the target customers of cloud services. In the 200 sample, most of enterprises (64%) had IT outsourcing experience. It is good for us to understand will history of enterprises affect their decision. In addition, there are 40% enterprises have less than 2 employees in IT department, which means that almost half of our sample has a small IT department or lack of IT employees. 31.5% enterprises have IT budgets under New Taiwanese dollars (NT) 1 million. Thus, we know that about 1/3 of our sample are those enterprises which are lack of IT human and financial resources. Furthermore, Constructs and measurement items used in this research are adapted from previously validated measures, or are developed on the basis of literature review.

This study then used SmartPLS version 2.0 to analyze the proposed model. The results including path coefficients and significance level of each variable are shown below (Table III).

Table III: Empirical Results

	Model	
Perceived Benefits	0.121	*
Perceived Concerns	-0.153	*
IT Resources	0.114	*
Environment	0.086	
IT Resources*Benefits	0.132	**
IT Resources*Concerns	-0.044	
R2	27.90%	

We found that perceived benefits positively influence cloud adoption (path coefficient = 0.121, p < 0.10) while Business concerns negatively influence cloud adoption (path coefficient = -0.153, p < 0.10). Furthermore, we found that a firm currently

with more IT resources will have higher intention to adopt cloud computing (path coefficient = 0.114, p < 0.10). Some IT experts and cloud vendors think firms that need cloud computing the most are those enterprises with limited IT budget, lack of IT staff and technological ability to maintain systems. However, our finding is contradictory to the statement. A possible explanation is that these firms have more resources and knowledge to try and experiment the efficacy of a new service, such as cloud computing. Therefore, they have higher intention to adopt cloud at early stage.

We further tested a moderating effect in our model. We found IT resources do strengthen the relationship between cloud benefits and adoption intention. Firms with more IT resources will feel more benefits of using cloud, and therefore, have even higher intention to adopt cloud.

However, our data show that Environment is not a significant factor influencing firms' cloud adoption decision. A possible explanation of this result is that the current cloud users of cloud service are technology innovators or early adopters, which have higher willingness to take risks, are daring to attempt new things, leading crowd, rather than being affected by the rest of majority [13]. Therefore, they are not affected by others (i.e. the Environment) too much. However, we know that cloud service is still in its early stage, and its users have not reach "critical mass" yet. Whether at the later stage of cloud's life cycle will environment becomes a significant factor influencing other type of customers (early majority, late majority, or laggards) is still worth investigation.

CONCLUSION

The exploratory study proposes a framework that weaves three important explanatory factors and one moderator of cloud adoption and categorizes cloud adopters into a typology. Our empirical investigation suggests that perceived benefits and business concerns are important factors that can explain the different level of cloud adoption. IT resources plays a moderating role in cloud adoption. External pressure from business partners, though is not significant in our empirical analysis, may play a critical role to the final decision a firm makes to switch from non-adopter to adopter based on our case interviews.

Our study provides some managerial insights for practitioners (cloud vendors, potential users, and government policy makers) to facilitate the adoption of cloud service. First, a low cost SMEs package with basic and required cloud service is preferred. Such package would benefits hundreds of thousands of start-up companies and SMEs, and consequently facilitates the adoption of cloud service. Second, a prompt incident management and disaster recovery is critical to adoption of cloud service. The majority respondents expressed their concerns on the service quality as they suffered cloud service crash. This concern conveys a signal to cloud service providers that a premium customer service is desperately needed to facilitate cloud adoption. Third, an effective and sustainable government policy for innovated SMEs would change their IT decision-making from traditional IT solutions to cloud service. Government subsidy, regulation completeness, and better infrastructure are what government could do to assist the development of cloud industry.

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