Investigating firm’s acceptance of cloud computing as disruptive information system: a conceptual model

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Abstract

Cloud computing has been studied extensively in management of information system literature. However, the study of cloud computing from disruptive innovation perspective is limited. Therefore, this paper would like to address it by conceiving a research agenda for elaborating cloud computing as a disruptive information system and how firms accept this disruptive technology. This paper tries to combine the disruptive technology concept with technology acceptance model by looking at cloud computing as the focus of interest.

Cloud computing is considered as one of the biggest IT transformational wave. Although there are a number of definitions of cloud computing, Truong (2010) defines cloud computing as a virtualized, self-maintained and managed platform that provides customers with a variety of scalable resources on demand. Cloud-delivered enterprise solutions that offer cheaper, simpler and often more broadly alternatives of enterprise computing might fit nicely into Christensen’s framework for disruptive innovation. Some studies reported that some businesses are hesitant in adopting this new technology. Forrester Research (2009) reported that only 2% of small businesses (businesses with fewer than 100 employees) are using cloud computing. Every year over USD270 billion dollars are spent on enterprise software every year, but so far, only a fraction of those dollars is spent for cloud applications (Levie, 2011). Since the acceptance of cloud computing is still low, this paper would like to investigate it by utilizing the modified technology acceptance model 2 (TAM 2) adopted from previous researches (e.g., Opitz et al, 2012) and look at its variables, i.e. perceived usefulness and perceived ease of use. Some concerns make firms are still hesitant in adopting this relatively new technology, i.e. about the security, privacy and data integrity (Truong, 2010). Therefore, one other variable will be added to the modified TAM 2, i.e., perceived credibility.

Key Words:
Cloud computing, disruptive technology, technology acceptance model
**Paper**

**Introduction**

Cloud computing is considered as one of the biggest IT transformational wave. Although there are a number of definitions of cloud computing, Truong (2010) defines cloud computing as a virtualized, self-maintained and managed platform that provides customers with a variety of scalable resources on demand.

Cloud-delivered enterprise solutions that offer cheaper, simpler and often more broadly alternatives of enterprise computing might fit nicely into Christensen’s framework for disruptive innovation. Some studies reported that some businesses are hesitant in adopting this new technology. Forrester Research (2009) reported that only 2% of small businesses (businesses with fewer than 100 employees) are using cloud computing. Every year over USD270 billion dollars are spent on enterprise software, but so far, only a fraction of those dollars is spent for cloud applications (Levie, 2011).

**Objective**

Since the acceptance of cloud computing is still low, this paper would like to investigate it by utilizing the technology acceptance model and look at its variables, i.e. perceived usefulness and perceived ease of use. Some concerns make firms are still hesitant in adopting this relatively new technology, i.e. about the security, privacy and data integrity (Truong, 2010). Therefore, one other factor will be added to original TAM that is perceived credibility.

**Cloud computing in IT**

Cloud computing provides businesses with a fundamentally different model of operation in which the service providers are responsible for hard parts in using software: installation, upgrade, maintenance, backups and security (Truong, 2010).

The architecture behind cloud computing is a massive network of interconnected servers, often with user-friendly interface, which allows user to select services (Bowers, 2011). Various type of cloud computing (Bowers, 2011 from SearchCloudComputing.com, InfoWorld Cloud Computing) is as follows: (1) Software-as-a-Service (SaaS): delivers a single application through a browser to thousands of customers using a multitenant architecture. (2) Infrastructure-as-a-Service (IaaS): an organization outsources the hardware used to support operations, including storage, hardware, servers, and networking components. (3) Platform-as-a-Service (PaaS): delivers development environments as a service. Customers build their own applications that run on the provider’s infrastructure, which are then delivered to users via the Internet from the provider’s servers.

**Cloud computing as disruptive technology**

Disruptive innovation theory was advanced by Christensen in his popular book *The Innovator’s Dilemma* (1997). According to Christensen, disruptive technologies are “technologies that provide different value from mainstream technologies and are initially inferior to mainstream technologies along the dimension of performance that are most important to mainstream customers”. Christensen emphasized that disruptive innovation could be classified into low-end and new-market disruptive innovation (Christensen and Raynor, 2003).

Cloud-delivered enterprise solutions that offer cheaper, simpler and often more broadly alternatives of enterprise computing might fit nicely into Christensen’s framework for disruptive innovation. Many cloud solutions today are disrupting the traditional IT solution provider by initially enter the “good enough” category. From there, the product roadmap became more elaborate and good
enough products becomes great, even better (Levie, 2011). It follows the low-end market disruption path. Levie (2011) further gave examples on some emerging companies that are operating in dimensions that were never easy or possible in a previous generation of software, offering new solutions that the incumbent can not attack, and therefore created new market disruption.

**Methodology in investigating the firm’s acceptance of cloud computing**

The technology acceptance model (TAM) by Davis (1989) (see Figure 1) and its improved model of technology acceptance model 2 (TAM2) (see Figure 2) by Venkatesh and Davis (2000) is proven and widely used models in the area of information technology. Researchers applied TAM to analyze a user’s behavior, particularly during the application of different types of information systems (Ramayah and Lo, 2007).

![Figure 1. TAM](image)

![Figure 2. TAM 2](image)

Opitz et.al (2012) conducted empirical research to investigate the technology acceptance of cloud computing in German IT department employing the TAM2. Their finding suggests that they need to rearrange the variables and propose a model shown in Figure 3.
In Opitz’ research, the concern about the security and privacy has not been addressed. However, as pointed out by Truong (2010), there are concerns about security, privacy and data integrity for adopting cloud computing. Therefore, in this paper we would like to suggest one more variable for investigating technology acceptance of cloud computing, i.e. perceived credibility that includes security and privacy in assessing the user’s plan to use cloud service in the future. This particular variable is adopted from online banking literatures, e.g. Amin, H. (2009). The conceptual model that we would like to suggest is presented in Figure 4.

**Conceptual Model and Hypotheses**

Since the model developed by Opitz et al. is a good and update model for describing technology acceptance of cloud computing we would like to adopt it. However, security, privacy and data integrity become concerns for users in adopting cloud computing. Therefore, we would like to include one more factor, i.e., perceived credibility. The model is figured below:

**Figure 4. Proposed conceptual technology acceptance model of cloud computing**

The hypotheses which were adopted from TAM 2 and modified from the model developed from the research of Opitz et al. (2012):

H1: Subjective norm will have a positive effect on Image

H2: Image will have a positive effect on Output Quality
H3: Job Relevance will have a positive effect on Output Quality

H4: Result Demonstrability will have a positive effect on Output Quality

H5: Output Quality will have a positive effect on Perceived Usefulness

The perceived of usefulness (PU) to the user relates to extrinsic factors like efficiency and effectiveness (Ramayah and Lo, 2007). Cloud computing provide the users with scalability so that the companies can use as much resources as they needed on demand and the resources can be scaled up or down smoothly (Truong, 2010) as one of the benefit among others. This might influence the perceived of usefulness of cloud computing, therefore the following hypothesis is proposed:

H6: Perceived usefulness will have a positive effect on Intention to Use

TAM suggests that adaptation is influenced by ease of use given that the easier a system or technology is to use, the greater its utility. Perceived ease of use (PEU) is normally related to the intrinsic characteristics of IT (ease of use and ease of learning the technology). The usage of cloud computing does not require company to deal with installation, upgrade, maintenance, and staff training (Truong, 2010) that might influence the perceived ease of use. Therefore, the following hypothesis is proposed:

H7: Perceived Ease of Use will have a positive effect on Intention to Use

The importance of the third construct, i.e. perceived credibility – security and privacy in assessing the user's plan to use cloud service in the future, is adapted from online banking literature. The importance of security and privacy to the acceptance of online banking has been noted in many banking studies (Pikkarainen et al., 2004). Since Truong (2010) posits that there are concerns about security, privacy and data integrity for adopting cloud computing, the same construct of perceived integrity will be deployed. The following hypothesis is proposed:

H8: Perceived credibility will have a positive effect on Intention to Use

H9: Intention to Use will have a positive effect on Actual System Use

Limitation and Further Research

This paper tried to propose a conceptual model for investigating the acceptance of cloud computing based on Technology Acceptance Model 2 and previous researches. Therefore, this conceptual model has to be followed by empirical research to test the model and get an insight of the significant factors in cloud acceptance. Authors plan to conduct the empirical research using this model. Considering that the previous researches focused only on the developed country setting, further research needs to be done in different setting, e.g. developing country. Furthermore, previous research did not take into account the credibility factor, therefore further research needs to include this factor.
Bibliography