

Do You Trust the Cloud? Modeling Cloud Technology Adoption in Organizations

Full paper

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Abstract

Cloud computing has become popular as an alternative to adding new information systems in IT-based organizations. As more corporate information and data are stored in the cloud, concerns for cloud-based security have grown. This study proposes a theoretical model for understanding cloud adoption, and furthers inquiry into the causal relationships between predictive and moderating factors. We empirically examine how these factors affect trust in corporate decisions to adopt cloud computing by performing a path analysis using SmartPLS. The result demonstrates that the perceived risks of cloud computing do influence the corporate users' attitude and behavioral control over cloud computing, but does not necessary have a significant impact on public trust in adopting cloud technology. People trust the cloud based on information received from marketing messages, social media and friends. This study contributes theoretically as well as methodologically to our understanding of cloud technology adoption.

Keywords

Cloud Computing, Technology Adoption, Theory of Planned Behavior, Structural Equation Modeling

Introduction

Ubiquitous computing technology has afforded us the opportunity to do business with a new agility. Cloud-computing has been adopted by many organizations as an alternative option for adding new IT systems, and is a proven model for access to ubiquitous networks within organizations (Mell and Grance 2011). However, the drastic growth of the cloud-computing environment has not necessarily led to an increase in security countermeasures. Thus the information security of these ubiquitous technologies has become a primary concern for corporate IT managers. As cloud-computing and storage have been widely adopted, the challenges of securing enterprise information assets and networks have become overwhelmingly complicated, and these challenges continue to grow (Sourour, Adel, et al. 2009). Policy makers and end-users have increasingly raised concerns about online privacy in the cloud environment (Yao, Rice, et al. 2007). Even when cloud technology is adopted, people's confidence in cloud security may be low, regardless of how much cloud providers guarantee security with marketing monikers like "Secure Cloud," or "Trust in Me" (Perez 2009).

The impact of adopting a cloud-computing environment has been broadly studied. Jamil and Zaki (2011), for example, stated that cloud-computing and web services run on network structures that are vulnerable to attacks, e.g., distributed denial of service attacks (DDOS). Although the exact nature of security threats may be different, cloud-computing presents important challenges in terms of security, privacy, and trust for cloud providers and users (Grance and Jansen 2011). Corporate data can be made accessed from anywhere, and so users have very little control over security issues with the cloud. The security countermeasures and architecture of cloud service providers are a black box to the end-users (Srinivasan 2012).

Hochschild, Crabill et al. (2012) stated that the perception of potential risk can emerge when raising the level of knowledge toward an object or a service. The user's perception can be influenced by fear of a particular result such as the problems of information theft by corporate insiders (Ho and Benbasat 2014;

Ho and Hollister 2015). Thus, in our study, we assume that organizational IT managers perceive risk based on their knowledge of the cloud security. Moreover, we are interested in learning the extent to which consumers trust cloud technology, and the level of trust corporate users put in the cloud that influences their business decisions and behavioral outcomes for adoption (Shaw 1997). Thus, we seek to answer the research question: *What factors influence corporate users to trust cloud-computing security for adoption of cloud services?*

Theoretical Framework Development

A user's behavioral intention can be expressed in his/her behavior only if the person decides at will to perform—or not perform—that behavior (Ajzen 1991). A central idea of the Theory of Planned Behavior (TPB) is to explain and predict an individual's action based on belief and intention (Ajzen 1985; 1991). In other words, people's attitude, subjective norms, and perceived behavioral control will influence their intention and behavioral outcome. Davis (1989) proposed the Technology Acceptance Model (TAM) in generalizing factors about how people adopt technology with two specific beliefs—perceived ease of use and perceived usefulness. These two belief-constructs determine a user's attitude and behavioral intent to use and adopt an information system, which can be linked to subsequent behavior (Southey 2011). These two theories together propose that users' perceptions will influence their intention to trust and behavioral outcome, which in our study is the cloud technology adoption.

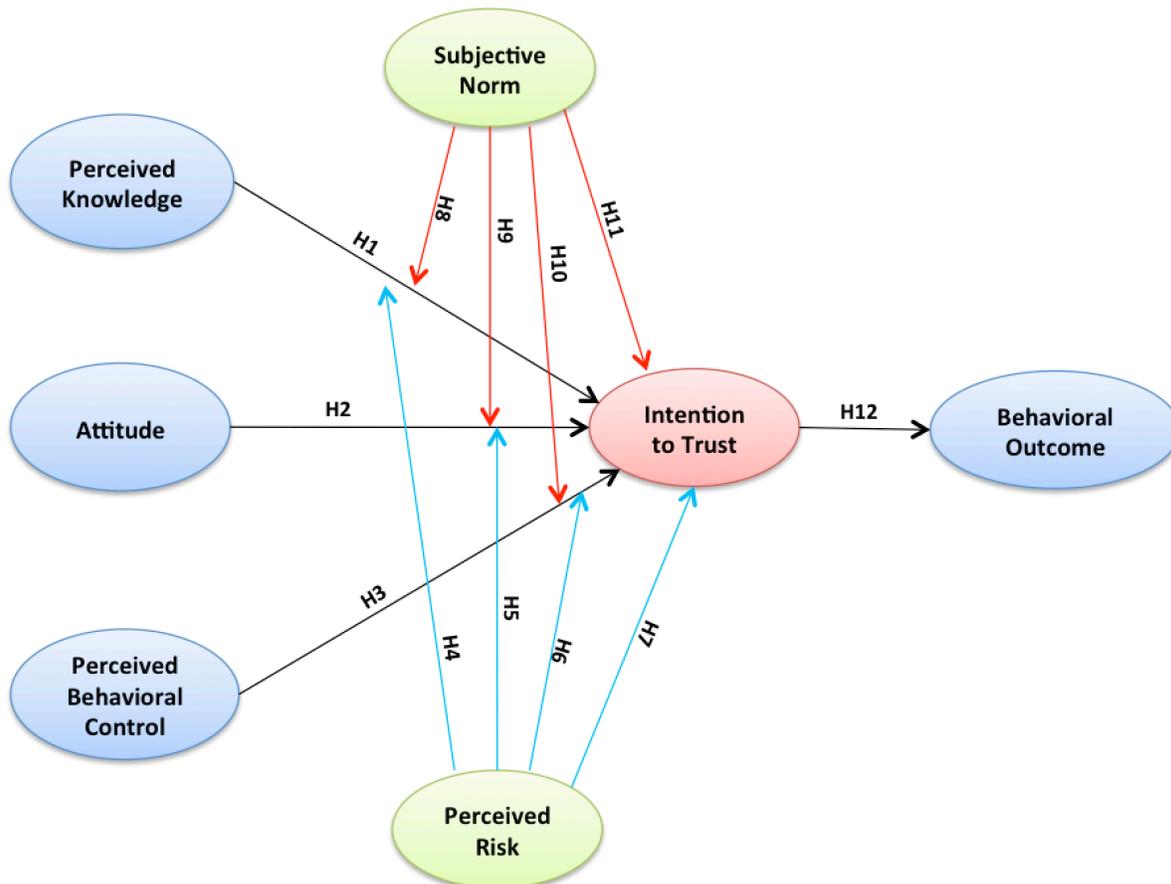


Figure 1: Conceptual framework

Based on the studies of Ajzen et al. (1980) and Davis (1989), we propose our research framework with a set of 12 hypotheses examining the user adoption of cloud technology (Figure 1). Our framework incorporates three predictive variables (perceived knowledge, attitude, and perceived behavioral control) that are essential to the user's intention and decision-making. We also incorporate two moderating-variables (perceived risks and subjective norms) that may influence the three predictive variables in their

trust intention as the dependent variable. These variables will eventually influence the users' behavioral outcome as a second dependent variable in adopting the cloud (Ajzen 1991). The details of how each hypothesis has been developed are described in the following paragraphs.

Trust Intention

Trust is a belief, but also an interactive process that involves at least two entities in an interpersonal relationship. Rotter (1980) stated that trust is an important variable that can affect human relationships at all levels. Mutual trust sustains interpersonal relationships and helps maintain the social fabric. Sztompka (1999) defines trust as the expectations of people, group or institutions, with whom we are in contact – interact – cooperate – to act in a positive or morally correct way for our benefit. Trust is the lubricant of commerce, essential to negotiations, and has also been related to competitive advantage. It is a factor in leadership, decision-making, innovation, and managerial effectiveness (Brown, Poole, et al. 2004). In a business context, trust is important with regards to high-risk profiles. Commerce without trust can cause a great deal of physical, financial or psychological harm (Bickmore and Cassell 2001). With positive feedback, trust can reinforce initial behavior (Zand 1972). Koller (1988) states that degree of trust depends on the strengths that an individual holds as their expectation. In reality, trust is built gradually and can be reinforced by initial behavior, previous trust expectations, and previous experience, which bring forth a positive experience (Lewicki and Bunker 1996; McAllister 1995). On the other hand, distrust can bring catastrophic consequences into collaborative relationships (Lewicki and Bunker 1996; Mollering 2001).

Moreover, trust can reflect an actor's psychological state to be dependent and vulnerable, and to be willing to accept risk (Rousseau, Sitkin, et al. 1998). Trust can be perceived as a cognitive construct, and defined as the one's reasonable expectations that another party possesses characteristics of being trustworthy and can be relied on with confidence, which guides decision-making and action. We could say that trust or distrust is the result of individual judgments or cognitive assessments that attribute benefits or costs to future behavior (Robert Jr., Dennis, et al. 2009). Thus, cognitive trust can be reflected in a customer's confidence or willingness to rely on a service provider's competence and reliability (Johnson and Grayson 2005).

Schaubroeck, Lam et al. (2011) refer to cognitive trust as the performance of relevant cognitions such as competence, responsibility, trustworthiness and reliability. The judgment of trust can be shifted from "disposition to trust" and "category-based processing" to "cognitive processing" of characteristics e.g., ability and integrity as a conscious choice (Robert Jr., Dennis, et al. 2009, p. 245). In cognitive trust, the trustee's actions can be observed, and the causes of actions are attributed to the trustee's internal trust-related characteristics (e.g., competence and integrity). Komiak et al. (2004; 2006), on the other hand, stressed the concept of trusting beliefs (McKnight, Choudhury, et al. 2002) as being consistent with the concept of cognitive trust, defined as a trustor's rational expectations that a trustee has the necessary attributes to be relied upon (Komiak and Benbasat 2006).

Emotional trust, on the other hand, refers to one's feeling secure and comfortable about relying on another (Komiak and Benbasat 2004; 2006). This includes a person's evaluation of gut feeling and faith (Rempel, Holmes, et al. 1985), and evaluation of personal emotional reactions to another (Komiak and Benbasat 2006). McAllister (1995) categorizes trust as the emotional ties between individuals with genuine concern and care for the wellbeing of each other. Emotion can disclose the value of a communicator in negotiation (Pietroni, Van Kleef, et al. 2008). For example, in a negotiation process, a negotiator may demand less of an angry person than a person who appears happy (Gross, Sheppes, et al. 2011, p. 766). Likewise, the decision-making of IT management can be occasionally affected by their emotions. Forgas (2003) indicates the decision of whether to trust a stranger or a competitor is particularly susceptible to being influenced by emotions. Dunn et al. (2005) states that emotion affects trust, but only to an extent that emotions fall within an assessment of particular controls. Myers et al. (2011) found that emotions have an effect on the behavior of the trust. In short, intention is an indication of a person's readiness to perform a given behavior, and it is considered to be an immediate antecedent of behavior (Ajzen 2006).

Perceived Knowledge

Knowledge represents a set of facts, information, skills or experiences a person acquires over time. Knowledge acquisition is an aggregative process of collecting, managing, storing, transferring and applying these sets of facts, skillsets and experience in order to obtain effective results and optimal performance in a situation. Thus, knowledge can be viewed as an asset in an organization (Antonova, Gourova, et al. 2009, p. 49). However, knowledge is a concept that is difficult to define or to achieve due to its nature, because it is relatively difficult to compare levels of knowledge. Blackler, Reed et al. (1993) stated that knowledge is subjective and tacit, because it requires a worker's subjective "feeling and thinking agent" to synthesize the informational object for better decision-making (Schultze 2000). Although knowledge is intangible, it can be viewed as a valuable asset to improve our ability to make decisions. In order to understand whether perceived knowledge has an impact on people's intention to trust cloud technology, we hypothesize that:

Hypothesis 1 (H1): The higher the cloud security knowledge of the corporate users, the higher their intention to trust the cloud services.

Attitude

Attitude refers to an expression of a person in favor or disfavor toward an object or a concept in a situation. Attitude has long been shown to influence behavioral intentions (Ajzen and Fishbein 1980; Pavlou 2003). Likewise, Henle, et al. (2010) states that attitude is a function of behavioral beliefs, which are derived from the likelihood of certain outcomes that result from the behavior and evaluation of those outcomes. Ltifi and Gharbi (2012) further stated that trust is simply a mental attitude and emotional disposition, with two types of beliefs: assessment and expectations. The attitude of corporate employees can often be influenced by self-produced factors, as well as perceived benefits and costs stimuli (Lai 2009). If business users have a positive attitude, it is likely that they can transfer this attitude towards the efforts of the company (Lee, Vernez, et al. 2013). Thus, attitude can be a predictive variable influencing a corporate user's trust intention to adopt the cloud. Thus, we hypothesize that:

Hypothesis 2 (H2): The higher the positive attitude of a corporate user toward cloud security, the higher their intention to trust in adopting cloud services.

Perceived Behavioral Control

The perception about one's ability to perform a behavior is determined by the total set of control beliefs (Ajzen 2006). The habitual and continuous IT use behavior is viewed as "repeated behavioral sequences" influenced and triggered by environmental cues. In other words, habits can moderate intention toward the outcome of IT use and adoption (Ortiz De Guinea and Markus 2009, p. 434). Thus, most organizations perceive information security not as an enabling technology or concept but as a product or a cost (Garfinkel 2012). Security has mostly been perceived as a technical issue that most executives rarely consider. Information security tends to be perceived as a low level technical function, following guidelines and information security policy, and operating independently from business strategies (PWC 2015).

The truth is that security is not just a technical problem, but is also impacted by non-technical factors such as compliance to standards, and the inability to attract and retain valuable workers (Garfinkel 2012). It is essential for organizations to retain valuable and knowledge workers, and to comply with the external legal requirements in order to defend against opportunistic hackers compromising the information systems and networks (Brancheau, Janz, et al. 1996; Ransbotham and Mitra 2009). However, the typical arrangement within these organizations is for the corporate IT department to set and maintain security standards and policies. Such an arrangement tends to result in vague standards and policies, and these policies could often be outside the control of the IT department (Kayworth and Whitten 2010). The knowledge workers in an organization in general have little or no control over organizational security.

Perceived behavioral control can influence systems usage (Elie-Dit-Cosaque, Pallud, et al. 2011). We thus assume that a greater awareness of the determinants for perceived behavioral outcome (PBC) may provide insights into how organizational IT users adopt system usage in the workplace. With this notion in mind, we hypothesize that:

Hypothesis 3 (H3): The higher the corporate users' perceived behavior control toward the security of their corporate data, the higher their intention to trust in adopting cloud services.

Perceived Risk

Virtualization technology enables IT usage and performance within organizations, but also simultaneously increases the IT managers' concerns about the intangible boundaries of the cloud-computing security (Dubie 2007). IT managers are aware of not only the controllability but also the risk in situations of uncertainty. Perceived risk is likely to be shaped by cultural background and experience (Keil, Tan, et al. 2000). For example, an individual who has experienced a car accident is likely to perceive high risk with driving on the road. It is fair to say that perceived risk as a psychological construct can explain behavior (Bauer 2001; Taylor 1974). Likewise, we can expand this idea to corporate users. Corporate cloud users could perceive the possibility and the risk of their organizational data being mixed with other company's data, or the possibilities that the data being accidentally released or disclosed to the public. The mixture of data amongst clients of a cloud provider, and the danger of the accidental release could expose companies to lawsuits. The inability to protect the integrity of data and the risk to privacy are greatly affected, which can be considered a significant security threat (Ward and Sipior 2010). Since storage in the cloud (cloud computing) services has been rapidly developed and adopted at the global level (Chi, Yeh, et al. 2012), the uncertainty of risk and its possible adverse effects to corporate data allow corporate users to create an expectation of perceived risks (Mitchell 1999).

In our study, we hypothesize that perceived risk as a moderating factor can influence corporate users' perceived knowledge, attitude and behavioral control toward cloud computing. The perceived risk will moderate the relationships between independent variables and dependent variables, and these relationships will be weakened when perceived risk is present. In other word, perceived risk might have an effect on knowledge, attitude, and behavioral control. Thus, three hypotheses are constructed below.

Hypothesis 4 (H4): A user's perceived risk toward cloud computing can influence their perceived knowledge of cloud security toward trust intention of adopting the cloud services.

Hypothesis 5 (H5): A user's perceived risk toward cloud computing can influence their attitude toward trust intention of adopting cloud services.

Hypothesis 6 (H6): A user's perceived risk toward cloud computing can influence their attitude toward trust intention of adopting cloud services.

In terms of predictive power to trust in a behavioral outcome, perceived risk is an expectation of loss potential associated with the purchase of a product or a service (Peter and Ryan 1976; Stone and Grønhaug 1993); it is not only an individual's estimation and controllability, but also the risks in situations of uncertainty that would affect their decision to adopt products or services (Dowling 1986). Perceived risk refers to feeling threatened by unknown situations (Hofstede, Hofstede, et al. 1991), and this can introduce negative effects to a consumers' intent to purchase or adopt (Mitchell and Groatorex 1993). Consumers' perceived risk should be uncovered in concept development and the testing stage of new product development. The manufacturer should find out if there is a risk reliever that might be both cost effective and perceptually effective in lowering the target market's probability of a negative consequence perception (Ha 2002; Ross 1975). If the privacy risk is the potential loss of control over company information, then, we hypothesize that the perceived risks of corporate users could be a predictive variable to affect a user's trust intention to adopt the cloud technology.

Hypothesis 7 (H7): The higher the corporate user's perceived risks toward cloud services, the higher their intention to trust cloud services.

Subjective Norm

Not only corporate customers such as IT managers perceive the risks of using cloud services, but the individual users also perceive the risks of their personal data, habits and preferences being logged and profiled. Risk becomes a common perception in using cloud technology. Since cloud storage services have become a trend due to rapid development of the global Internet technology, the subjective norms of cloud-computing has a moderating effect on users' perceived risk and usage intention (Chi, Yeh, et al. 2012).

Ajzen (1985; 1987) defines subjective norm as a person's belief that most of her important others think that s/he should (or should not) perform a specific behavior. In other words, the subjective norm can influence user's intention and their behavioral outcome. Empirical tests of social influence or subjective norms on attitudes toward IT have produced mixed results (Yang, Moon, et al. 2009). Venkatesh et al. (2000) found that subjective norms are an important determinant of intention and behavior, and thus subjective norms help determine the acceptance of, and the use of, technology on the basis of the theory of planned behavior (TPB) (Ajzen 1985; Ajzen 1991). Subjective norms are more salient during early adoption or diffusion of technology, because they can influence users' knowledge, belief, attitude, etc. (Taylor and Todd 1997). Likewise, moral standards and norms can influence personal attitudes, behavioral outcomes, or social consequences (Manstead 2000). Several studies have suggested that an individual's level of experience with the focal technology can influence the strength of relationships in the TAM model (Davis 1989; Lewis, Agarwal, et al. 2003; Taylor and Todd 1995); thus, subjective norms can moderate the relationship between perceived knowledge, attitude, and perceived behavioral control. We can hypothesize that subjective norms can influence user's perceived knowledge, attitude and their perceived behavioral control as a moderating factor. These relationships will be strengthened when subjective norms are present.

Hypothesis 8 (H8): The subjective norm can influence corporate user's perceived knowledge on their intention to trust in the adoption of cloud services.

Hypothesis 9 (H9): The subjective norm can influence corporate users' attitude toward their intention to trust in the adoption of cloud services.

Hypothesis 10 (H10): The subjective norm can influence corporate users' behavioral control toward their intention to trust in the adoption of cloud services.

Moreover, subjective norm is a social norm, which is an aggregative term measuring the social pressure engaged from friends, family and relatives (Linden 2011). Ajzen (2006) further defines subjective standards and norms as perceived social pressure, which is determined by the total set of accessible normative beliefs about the expectations of the important references. As discussed earlier, attitude is a function or a determinant of beliefs toward behavior (Henle, Reeve, et al. 2010). We thus hypothesize that the subjective norm can be a predictive variable to affect the trust intention of the corporate user.

Hypothesis 11 (H11): The higher the subjective norm of the corporate users, the higher their intention to trust cloud services.

Behavioral Outcome

Behavior is normally related to outcomes at the level of aggregated consequences rather than momentary effects (Bandura 1977; Baum 1973). Consequences could affect an individual's behavior through the influence of thought and belief; thus, positive or negative reinforcement of someone's belief can influence their behavior (Bandura 1977; Baron, Kaufman, et al. 1969). Compeau and Higgins (1995) believe that expectation about the consequences of a behavior is a strong force guiding peoples' decision and actions. People in general are more likely to undertake behaviors they believe will result in favorable consequences. Ajzen (2006) further emphasizes that behavior is an observable response or outcome manifested in a given situation with respect to a specific targeted person. In fact, IT users' attitudes are closely related to their actual use of the system, and usage behavioral outcome is the means by which the full potential of the system can be realized (He and King 2008). In this study, we hypothesize that trust intention can be a predictive variable to influence the corporate user's behavioral outcome (aggregated consequence) as a dependent variable.

Hypothesis 12 (H12): The higher the corporate users intention to trust cloud computing, the more likely they will adopt the cloud services as a behavioral outcome.

Below, we discuss the demographics of the data collected, the reliability of the dataset, and the results of the hypotheses testing.

Methods

Data Collection

Survey research was conducted during September 2013 through February 2014. The data was collected using a 7-point Likert scale, ranging from “strongly disagree” to “strongly agree” (Appendix). Originally, data from 203 respondents, geographically distributed across different countries, was collected. The sample was selected randomly. The study population focused on senior management, including systems managers, staff in the information system area, managers and those involved in decision-making.

There are 170 completed surveys in the dataset after removing incomplete data. The clean dataset contains 121 males and 49 females. The dataset included respondents from both public and private sectors. Of these respondents, 27% hold the position of Managing Director of IT, 17% managers, 20% IT Professional, 5% programmers and a 27% in another profession (as in the area of finance and computer technician). Most of the surveyed respondents have a university degree, Bachelor’s degree being the highest percentage with 46% and Master’s degree with 38%. The average age of the respondents was in the range of 31-50 (60%). There were 31% of the respondents who have 5-20 years of IT experience. 88.95% of respondents had heard about cloud computing, and 72% had used cloud storage.

Reliability Test and Factor Analysis

The reliability test was conducted for the overall consistency across all 170 dataset, and the Cronbach's Alpha value was derived as $\alpha=94.8\%$, which is very close to 1. This value suggests that the dataset is highly reliable (Sekaran and Bougie 2013). Moreover, a factor analysis was conducted to identify the internal consistency for all survey questions, which gives us an array of correlations (Morales Vallejo 2013). We measured the adequacy of sampling and the Kaiser-Meyer-Olkin (KMO) test result reveals that the instrument used for research is appropriate with $KMO=0.916$, $p<0.01$. The solution of the factors explained approximately 75.3% of the total variance. The result reveals that the assertions were regrouped from 7 components. The seven factors identified in the factor analysis show that the assertions of the instrument are mostly oriented to measure the intended variables measured.

Hypotheses Testing Results

We conducted a linear regression test and obtained $R^2=0.687$ between the predictive variables and the dependent variable. This coefficient falls between 0.60 and 0.70 in the exploratory research, which suggests that the predictive variables do have an impact on the dependent variable. Thus, the results reveal that the predictive variables, including attitude toward behavior (H2), perceived behavioral control (H3), perceived risk (H7), and subjective norm (H11), does influence the dependent variable trust intention at a significance level of $p<0.01$. The results additionally show that the coefficient for the predictive variable perceived knowledge in cloud security (H1) is not significant, which means that the perceived knowledge is not a good predictive variable for the trust intention.

| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate |
|-------|-------------------|----------|-------------------|----------------------------|
| 1 | .755 ^a | .570 | .567 | .91861 |
| 2 | .807 ^b | .651 | .647 | .82985 |
| 3 | .823 ^c | .677 | .671 | .80115 |

a. Predictors: (Constant), Subjective Norm

b. Predictors: (Constant), Subjective Norm, Perceived Risk

c. Predictors: (Constant), Subjective Norm, Perceived Risk, Perc. Beh. Control

d. Dependent Variable: Trust Intention

Table 1: Stepwise regression model summary

We also ran a stepwise regression to confirm whether a relationship exists between the predictive variables and the dependent variable (trust intention). The stepwise regression identified three models. In model 1, $R^2=0.57$ of variability was determined between the predictive variable (subjective norm), and the dependent variable (trust intention). In model 2, $R^2=0.651$ of variability was determined between the predictive variables (subjective norm and perceived risk), and the dependent variable (trust intention). The model 3, $R^2=0.677$ of variability was determined between the predictive variables (subjective norm,

perceived risk, and perceived behavioral control) and the dependent variables (trust intention). The stepwise model suggests that model 3 fits the best measures of adjusting the equation to data, and the best validity between the displayed models (Table 1). In other words, the predictive variables of subjective norm, perceived risk and perceived behavioral control should be able to predict the dependent variable of trust intention. However, based on the stepwise regression, while the standardized coefficients (beta), and *t* value are significant, they did not indicate whether the moderating variables (subjective norm and perceive risks) have an influence over the independent variables (perceived knowledge, attitude and perceived behavioral control).

We used SmartPLS v2.0 to identify the latent variables and their path relationships, and to validate the research model (Figure 2). The variables associated in this research model include perceived knowledge in cloud-computing security (as independent variable PK), attitude toward behavior (as independent variable A), perceived behavioral control (as independent variable PBC), subjective norms (as moderating variable SN), perceived risk (as moderating variable PR), trust intention (as dependent variable TI), and behavioral outcome (as dependent variable BO). In the Figure 2, we found that the moderating variables (subjective norm and perceived risk) have a direct effect on the exogenous latent variables (perceived knowledge in cloud-computing security, attitude toward trust intention, and perceived behavioral control) because the path coefficient for these relationships is below 0.10 (Hair Jr., Hult, et al. 2014). As a rule of thumb, for sample sizes of up to about 1000 observations, path coefficients with standardized value above 0.20 are usually significant and those with values below 0.10 are usually insignificant.

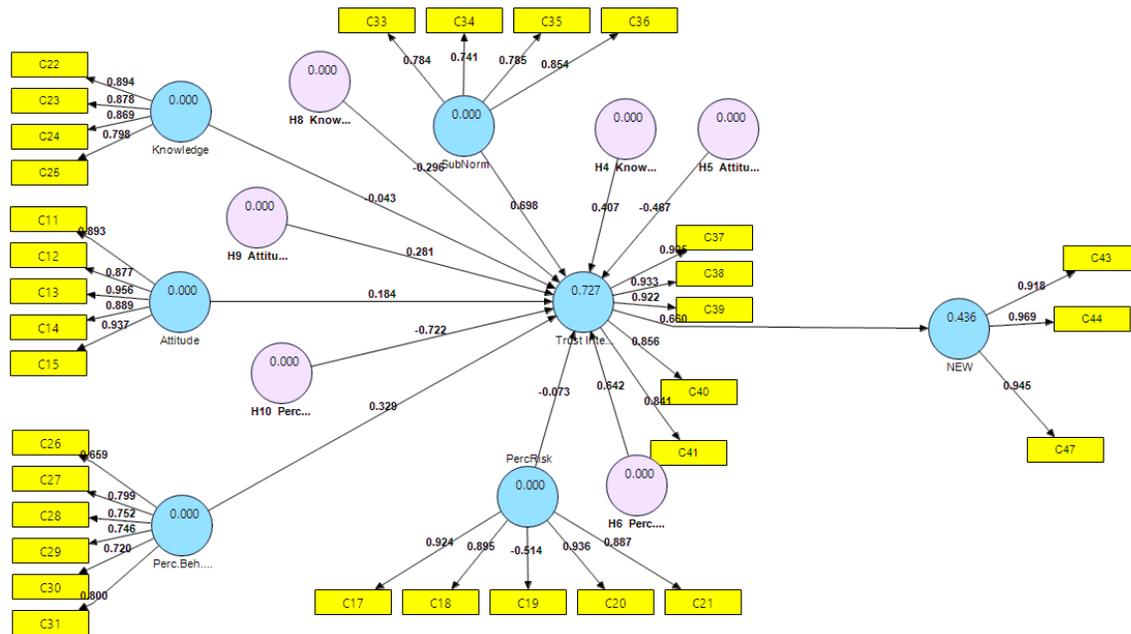


Figure 2: A multivariate analysis with moderating variables

Based on the Figure 2, the $R^2=0.727$ of variability (R^2) was obtained between all predictive variables and the dependent variable (trust intention). The results reveal that the predictors attitude ($H2: \beta = 0.184$), perceived behavioral control ($H3: \beta = 0.329$), and subjective norm ($H11: \beta = 0.698$) have a significant relationship with the dependent variable (trust intention). Thus, H2, H3 and H11 are supported.

The coefficient value for the perceived knowledge in cloud-computing security ($H1: \beta = -0.043$) is below 0.10, which indicates that perceived knowledge is not a good predictor to trust intention. H1 is not supported. Moreover, the coefficient value for the perceived risks ($H7: \beta = -0.073$) is also below 0.10, which indicates that perceived risk is not a good predictor of trust intention. H7 is not supported.

In this model, the moderating variable perceived risk intervenes with and influences the independent variables including perceived knowledge in cloud-computing security ($H4: \beta = 0.407$), attitude toward behavior ($H5: \beta = -0.467$), and perceived behavioral control ($H6: \beta = 0.642$). Thus, H4, H5, and H6 are supported. Likewise, the moderating variable subjective norm intervenes with and influences the

independent variables, including perceived knowledge in cloud-computing security (H8: $\beta = -0.296$), attitude toward behavior (H9: $\beta = 0.281$), and perceived behavioral control (H10: $\beta = -0.722$). Thus, H8, H9, and H10 are supported.

Moreover, the $R^2=0.436$ of variability (R^2) was obtained between the predictive variables (trust intention) and the dependent variable (behavioral outcome). This result reveals that the higher the corporate users intention to trust the cloud-computing, the more they are likely to adopt cloud services as their behavioral outcome with $\beta = 0.660$. H12 is supported. Table 2 summarizes the findings of the path analysis.

| | | | | |
|-----|------------------------------|------------------------------|------------------|----------------------|
| H1 | Perceived knowledge | Intention to trust | $\beta = -0.043$ | Not supported |
| H2 | Attitude | Intention to trust | $\beta = 0.184$ | Supported |
| H3 | Perceived behavioral control | Intention to trust | $\beta = 0.329$ | Supported |
| H4 | Perceived risks | Perceived knowledge | $\beta = 0.407$ | Supported |
| H5 | Perceived risks | Attitude | $\beta = -0.467$ | Supported |
| H6 | Perceived risks | Perceived behavioral control | $\beta = 0.642$ | Supported |
| H7 | Perceived risks | Intention to trust | $\beta = -0.073$ | Not supported |
| H8 | Subjective norm | Perceived knowledge | $\beta = -0.296$ | Supported |
| H9 | Subjective norm | Attitude | $\beta = 0.281$ | Supported |
| H10 | Subjective norm | Perceived behavioral control | $\beta = -0.722$ | Supported |
| H11 | Subjective norm | Intention to trust | $\beta = 0.698$ | Supported |
| H12 | Intention to trust | Behavioral outcome | $\beta = 0.660$ | Supported |

Table 2: SEM summary

Study Limitation and Future Research

This study has limitations. First, limited by survey design, the study does not identify participant counts per continent. Also, gender distribution is unequal, which may introduce gender bias. However, our research model and the findings are generalizable because data was collected through various channels from human subjects in different companies and government agencies across different continents. Furthermore, this research does not include the actual security investigation of cloud technology infrastructure, and is limited to cognitive perspective as latent variables. Future research is expected to study other variables that may influence trust intention, such as cost and information privacy.

Conclusion and Contribution

The purpose of this study is to explore to what extent corporate users trust cloud-computing security to facilitate the adoption of cloud technology. Understanding trust indicators in the decision making process of cloud-computing adoption and determining the level of confidence in the corporate users has become important to both the consumers and cloud service providers. Our study contributes to the practitioners' community in that the perceived risk and subjective norm (as independent moderating-variables) have a positive effect on the trust intention and behavioral outcome (as dependent variables). In other words, perceived risk can influence consumers' perceived knowledge, attitude, and behavioral control over their trust intention in the cloud, and consumers are often influenced by social influence and friends' when making decisions about adopting cloud service. This is true for both private and public sectors.

Moreover, our research contributes to a rigorous methodological approach for the creation of a survey research tool that measures trust indicators and behavioral outcomes in the adoption of cloud-computing technology. This research also contributes to a theoretical framework for cloud technology adoption, which was evaluated and validated with path analysis.

Appendix

| | Strongly Disagree | Disagree | Somewhat Disagree | Neither Agree nor Disagree | Somewhat Agree | Agree | Strongly Agree |
|--|-------------------|----------|-------------------|----------------------------|----------------|-------|----------------|
| Knowledge in Cloud-Computing Security | | | | | | | |
| I have sufficient knowledge about the cloud storage security. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| I possess enough knowledge to use and work with cloud storage. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| I have sufficient experience in knowing the security of the cloud storage services. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| I am confident that the service provider has sufficient and knowledgeable technical personnel to manage and secure the cloud storage. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| Attitude | | | | | | | |
| Using cloud storage is a right and helpful idea. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| Using cloud service is an acceptable solution to my corporate data storage. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| Use cloud storage is a good idea. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| I am excited about the idea of using the cloud storage. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| Use cloud storage is a positive idea. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| I am bored about the idea of using the cloud storage. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| Perceived Behavioral Control | | | | | | | |
| I possess enough knowledge to use cloud storage. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| I am certain that the personal information I provide to the services provider is secure. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| I have the knowledge that the service provider does not use unsuitable methods to collect my personal data. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| Using the cloud storage service is easy. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| Using the cloud storage service is simple. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| Using the cloud storage service is under my control. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| Perceived Risk | | | | | | | |
| I believe that my corporate data stored on, and manage by this cloud storage services provider is secure. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| I am comfortable that the service provider of this cloud storage solution will not use unsuitable methods to collect my personal data. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| I am skeptical about putting my corporate information in someone else hands. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| I perceive that my corporate data stored on, and managed by this cloud storage service provided is well protected. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| I believe the service provider of this cloud storage solution will perform due diligence, and secure our corporate data. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| Subjective Norm | | | | | | | |
| The reputation and recognition of the services provider influence me in my decision whether to use cloud storage. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| Most people who are important to me think it is a good idea to use cloud storage | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| The advertisement of the services provider influence me in my decision whether to use cloud storage. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| The competitiveness in my industry influences me in my decision whether to use cloud storage | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| Most people who are important to me would use cloud storage. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| Trust Intention | | | | | | | |
| Cognitive Trust | | | | | | | |
| For me, using the cloud storage in the next six months is important. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| I plan to use cloud storage in the next six month. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| I anticipate I will use cloud storage in the next six months. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| Emotional Trust | | | | | | | |
| The Platform as a Service (PaaS) of this service provider is dependable and honest in providing secure cloud storage services. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| The services provider is competent and trustworthy in handling and securing my data. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| Behavioral Outcome—Personal related consequence of the behavior | | | | | | | |
| Had I failed to use the cloud storage technology when the company required me to during the past three years? | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| After the cloud storage is implemented, do I have limited access to corporate information when I need them? | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| Do I expect my company to continuously use the cloud storage technology in the next three years? | 1 | 2 | 3 | 4 | 5 | 6 | 7 |

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