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The Effective Factors of Cloud Computing Adoption Success in Organization

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Abstract

The purpose of the research is to verify how task characteristics for business and technology characteristics, economic feasibility, technology readiness, organizational factors, environmental factors of cloud computing affect the performance of cloud computing adoption through Fit and Viability. The research aims to verify the relationship among the success factors for adopting cloud computing based on the Fit-Viability model. Respondents who work for IT companies which is using cloud computing in South Korea were chosen. The data was analyzed by the structural equating model. As a result, Task characteristics and Technology characteristics affected Fit in a positive manner, while Technology readiness, Organizational factors and Environmental factors also positively impacted Viability. Fit and Viability both affected the successful adoption of cloud equally. In particular, Environmental factors were proven to have the biggest impacts on Viability, and affected highly indirect impact on the Performance of cloud computing adoption through Viability. Entering the era of the fourth industrial revolution, corporations have established digital transformation strategies to secure a competitive edge while growing continuously, and are also carrying out various digital transformation initiatives. For the success of adoption of foundational technologies, they need to understand not only the decision-making factors of adopting cloud computing, but also the success factors of adopting cloud computing.

Keywords: Cloud Computing, Adoption Success, Fit-Viability, Digital Transformation, Task-Technology Fit.

JEL Classification Code: L15, L21, L24, L86, M15.

1. Introduction

The fourth industrial revolution, which can be described as the convergence among technologies, affect almost all countries, and is being processed at a change of speed which is exponential instead of linear. The width and depth of such change is forecasting changes in the production, management and governance of the entire system (Schwab, 2017). Through the Digital Transformation Initiatives Research, the World Economic Forum selected Artificial intelligence, Autonomous vehicles, Custom manufacturing and 3D printing, Internet of Things and connected devices, Robots and drones, Social media and platforms as well as Big Data Analytics and Cloud, which become the basis of such aforementioned technologies as the seven technologies of the fourth industrial revolution (World-Economic-Forum, 2017). Corporations are also establishing digital transformation strategies to secure a competitive edge and to grow in a sustainable manner; they are also adopting the basis infrastructure, cloud computing as well as big data analytics system (Hanelt, Piccinini, Gregory, Hildebrandt, & Kolbe, 2015).

In 2018, the world's public cloud service market is projected to be $186.4 billion, growing 21.4% year-on-year, of which cloud system infrastructure services (Infrastructure as a service) has been identified as the fastest growing industry, growing at an annual growth rate of 35.9% to stand at $302 billion (Gartner, 2018).

In Korea, the cloud computing market has been initiated by Korea Telecommunication and SK Telecommunication in 2011 in cloud service for individuals. Now, many cloud service providers are providing cloud services to not only individual users but also to corporations and public institutions. From 2012, the Korean government has started to provide G-Cloud service, cloud service to government agencies (Kim, Hwang, Suh, & Kim, 2015; Korea, 2011), and in 2015, it enacted legislations to facilitate the use of

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clouding with the aim of becoming a leading cloud computing country by the year 2021 (Do & Kim, 2017; Lee, Min, & Kwon, 2017). From 2015, global cloud computing service providers including Amazon Web Service(AWS) and Microsoft(MS) began to establish data centers in Korea to provide cloud computing services. Such cloud-related environmental changes have made the adoption of cloud service a very crucial point to consider for corporations and public institutions. According to recent research results, it was found that four out of ten companies have already adopted the cloud computing system (IDG, 2018).

Continued technological changes have become a threat to the conventional business model, while providing new business services at the same time(Lai, 2006). Information communication technology(ICT) affects the productivity of firms significantly only when it is widely distributed and used within a firm. Therefore, it is very important to understand the deciding factors of adopting ICT (Oliveira & Martins, 2011). The research on decision-making factors of adopting cloud computing technology and its success factors have been topics of research continuously starting from 2011 (Abdollahzadegan, Hussin, Razak, Moshfegh Gohary, & Amini, 2013; Garrison, Kim, & Wakefield, 2012; Garrison, Wakefield, & Kim, 2015; Low, Chen, & Wu, 2011; Morgan & Conboy, 2013; Walther, Sedera, Sarker, & Eymann, 2013; Yeboah-Boateng & Essandoh, 2014). However, the previous researches on the success factors of cloud computing were empirical studies on the high-level decision makers within firms who have little experience in using the cloud computing services (Garrison et al., 2015), and while this can be meaningful for the research on the decision-making factors on the adoption of cloud computing, it had limits as research on the success factors of adopting cloud computing.

The following research was carried out on domestic and international IT corporations operating within Korea that have adopted the cloud computing, and especially on their 198 managers and employees who are using the cloud computing service for work. In addition, this is a type of research not on the adoption of cloud computing for specific application services, rather it is aimed at verifying the factors that affect the success of adopting cloud computing for the good of the overall business activities. The Fit-Viability Model(FVM) based on the theory of Task-Technology Fit was utilized (Liang, Huang, Yeh, & Lin, 2007). It looked into how task characteristics and the technology characteristics of cloud computing impact the Fit, while looking at how economic feasibility, technology readiness, organizational factors and environmental factors affect viability. It also carried out empirical research on the effects of fit and viability on the performance of cloud computing adoption as well as their relationship. Through this, ultimately, the research has verified empirically the impacting factors of corporate cloud computing adoption success factors. The outcome of the following research is expected to be helpful to the decision makers who wish to adopt cloud computing successfully within their firms and provide meaningful advice in the process of establishing exact strategies and decision making.

2. Literature Review

2.1. Cloud Computing Adoption and Success in Organization

In 2006, AWS, Google and other similar service providers introduced new Internet-based computing system, or cloud computing services to the market (Yang & Tate, 2012). Cloud computing was a new terminology that referred to the concept of computing consumption where users pay according to the amount of use (Armbrust, Fox, Griffith, Joseph, Katz, Konwinski, & Stoica, 2009), and it adopted the standard of service level agreements between service providers and users (Buyya, Yeo, Venugopal, Broberg, & Brandic, 2009). The on-demand self-service, broad network access, resource pooling, rapid elasticity and measured service were the five essential features that defined the concept of cloud, which was classified into private cloud, community cloud, public cloud, hybrid cloud according to the deployment model; and classified into Infrastructure as a Service(IaaS), Platform as a Service(PaaS), Software as a Service(SaaS) according to the service model. This is the concept defined by the United States National Institute of Standards and Technology(NIST), which is used most widely (Mell & Grance, 2011).

The research on cloud computing has been carried out on its concept, architecture, key technology and challenges (Jadeja & Modi, 2012; Luo, Jin, Song, & Dong, 2011). Lately, as for research on cloud computing-related technologies, there are research on various storage formation technologies within cloud to provide big data analytics and AI services (Hsu, Lo, Yuan, Chien, Kuo, & Huang, 2015; Shetty, Sankar, Jassal, Patel, & Sharma, 2015), and the research on multi-level cloud computing system has begun (Messerli, Voccio, & Hincher, 2017). In addition, there were also previous researches on the success of work performance in accordance to the individual users' adoption of cloud computing (Park & Koo, 2012).

As for initial research on the adoption of cloud computing by firms, there were research on the effectiveness of adopting cloud a well as its strategic alignment (Chebrolu, 2011). Moreover, there were also carried out on the security, performance as well as the challenging issues of the integration of conventional system and cloud and their interoperability (Dillon, Wu, & Chang, 2010). Many researchers also carried out studies on the achievements or gaps of the successful adoption of cloud computing (Dahlberg, Kivijärvi, & Saarinen, 2017; Venters & Whitley, 2012; Yang & Tate, 2012), and a large amount of research were carried out on the success of determining factors of cloud computing (Garrison et al., 2012; Low et al., 2011; Oliveira, Thomas, & Espadanal, 2014; Walther et al., 2013).

More recently, the research trend seems to be focused on structuring the necessary model for the decision making process of adopting cloud computing for firms in a hierarchical way and on how decision makers prioritize decision area, decision factor and decision attribute (Yoo & Kim, 2018). The scope of research is also expanding to include the adoption of cloud computing that consider the characteristics of nations and small-and-medium enterprises (Alshamaila, Papagiannidis, & Li, 2013; Bhat, 2013; Gutierrez, Boukrami, & Lumsden, 2015). The case studies on the direct impact factors that have affected global firms in adopting cloud computing are also being reported (Schlagwein, Thorogood, & Willcocks, 2014; Winkler, Benlian, Piper, & Hirsch, 2014). In addition, as for the success factors of cloud computing, research aimed at identifying the success factors for deploying cloud has also been disclosed (Garrison et al., 2012).

The research on cloud computing adoption by firms, in particular, has been carried out by utilizing various theories and models. Low et al. (2011) has proposed the Technology-Organization-Environment(TOE) framework-based basic model for firms to adopt cloud computing, while Gangwar, Date, and Ramaswamy (2015) have utilized TAM-TOE framework related to the adoption of cloud computing. Utilizing the Task-Technology Fit(TTF) as the evaluation model for the adoption of cloud computing, Tripathi and Jigeesh (2015) have carried out case studies on four firms. Through this, the individual task performance within organizations that use cloud computing technology has been diagnosed. Moreover, Tripathi and Nasina (2017) utilized the Fit-Viability Model to diagnose the success and failure of cloud computing adoption for the business of corporations rather than for specific application purposes.

2.2. Task-Technology Fit on Cloud Computing

In adopting new technology, the Fit, which is the degree to which the characteristics of the tasks that the user must carry out meet those of the technology to be adopted determines the positive impact on the individual's task achievements (Goodhue & Thompson, 1995). In order to measure task-technology fit, Goodhue and Thompson (1995) proposed eight factors - quality, locatability, authorization, compatibility, ease of use/training, production timeliness, system reliability, and relationship with users - and discovered that these act a crucial predicative variables together with utilization that bring improvement in system effective in areas of task achievement and usability. While the model proposed by Goodhue and Thompson (1995) was an analysis on the individual user level, Zigurs and Buckland (1998) proposed a similar model for the entire group by applying task-technology fit theory to the Group Support System.

In the research on Task-Technology Fit model to evaluate the adoption of cloud computing, Tripathi and Jigeesh (2015) utilized automation, resource sharing, multitenancy, internal expertise and remote implementation as the task characteristics related to cloud computing, while utilizing free maintenance and management, on-demand self-service, broad network access, rapid elasticity, resource pooling, virtualization, service-oriented architecture as the technical features of cloud computing necessary to implement the tasks of organizations. In addition, Yadegaridehkordi, Iahad, and Ahmad (2016) utilized the task-technology fit to carry out diagnosis research, and categorized Cost Saving, Ease of Implementation, Flexibility, Mobility, Scalability, Sustainability, Personal Learning Environment, Processing Capabilities, Agility, Collaboration, Usability, Measured Service, on Demand-Self Service, and Resource Pooling as the technical features of cloud computing, and utilized personalization, Collaboration, Mobility as the technical features that deserve attention.

Mohammed, Ibrahim, and Ithnin (2016) carried out research on the development of measuring instruments for effective factors that affect cloud computing adoption in developing countries in order to establish E-government system. The Fit-Viability Model was used as the basic model, and Servicing citizens, Internal operations, Exchanging and sharing information were used as task characteristics while Relative Advantage, Compatibility, Complexity, Trailability, Security were used as technology characteristics.

At a time when market competition is becoming ever more intensified with the introduction of destructive innovative firms that utilize sophisticated technology, corporations must pursue cost effectiveness (Chesbrough, 2007), and react to consumers' demands with agility. To this end, agility in utilizing IT services is ever more desperate (Margaria & Steffen, 2008; Setia, Sambamurthy, & Closs, 2008). In the following research, such business characteristics demanded from the corporations as well as the cloud technology characteristics suggested by NIST were used as the foundation to come up with the following two hypotheses.

Hypothesis 1: Business Task characteristics have a positive influence on Fit.
Hypothesis 2: Technology characteristics have a positive influence on Fit.

2.3. The Effective Factors and Viability on Cloud Computing

Liang et al. (2007) refined the Fit-Viability Model in the research on the framework aimed to diagnosis the successful application of mobile technology within organizations, and verified that economic, IT infrastructure, Organization are the effective factors of Viability. In the research on the adoption of Social networking software to support the group decision-making, Turban, Liang and Wu (2011) defined Economic: Feasibility, Justification, IT Infrastructure: Readiness, Security, Risks, Organization: Readiness, Privacy, Management Support, Organizational Culture, Resistance to Change, Legal, Copyright as the effective factors of Viability. In the research on Viability Model, targeting Greek digital city, Anthopoulos and Tougountzoglou (2012) utilized the Economic and Acceptability factors. Muhammad, Seitz and Wickramasinghe (2013), in the research on the understanding of Cross-Cultural ERP Implementation Impact, defined that Viability is the degree to which the system when it is decided to be either adopted or established, affects organization and nation; included political and social, economic, environmental, infrastructure/technology were as the National level factors that affect Viability.

Through the research on E-government maturation decisive factor in the view point of Fit-Viability, Larosiliere and Carter (2013) defined economic, organizational, IT infrastructure as the impact factors, and proved via empirical research the statistic meaningfulness of the hypothesis that such factors affect Viability. In the research on cloud service viability in the perspective of consumers, Trenz and Huntgeburth (2014) suggested customer satisfaction, loyalty, Word-of-Mouth(WOM) and Willingness to Pay(WTP) as the key performance indicators of Viable Cloud Services. In the research on factors that impact the adoption of cloud computing to implement E-government within developing countries, Mohammed et al. (2016) used Fit-Viability model as the basic model to develop the measurement instrument of the research model that identifies fit and viability as the effective factors of cloud adoption. In the research, Economic feasibility, Organizational factors, Technology Readiness were defined as the effective factors of viability. The credibility and validity of the developed measurement instrument were proven by the pilot study using the response data of 26 IT staff members of 5 public corporations in Oman. In the research on the adoption of cloud computing in business, Tripathi and Nasina (2017) utilized Economics, IT infrastructure, Organization as the concept factors that affect Viability. In addition, within the business environment where strong government regulations including the Act on Facilitating Cloud Use and incentive scheme, as it is in Korea (Do & Kim, 2017; Lee et al., 2017), environmental factors must be considered as independent variables that affect Viability. Based on such prior researches, the following research establishes the following hypotheses.

Hypothesis 3: Economic feasibility have a positive influence on Viability.
Hypothesis 4: Technological readiness have a positive influence on Viability.
Hypothesis 5: Organizational factors have a positive influence on Viability.
Hypothesis 6: Environmental factors have a positive influence on Viability.

2.4. Fit and Viability on Performance of Cloud Computing Adoption

Just as corporations have established digital transformation strategies recently and carrying out various digital transformation initiatives simultaneously, Tjan (2001) suggested the two-dimensional evaluation model with the Fit and Viability as its axes to evaluate the Internet initiatives that were being carried out simultaneously at SUN Microsystems in the early 2000s when Internet business was receiving spotlight. Based on the strategic matrix suggested by Tjan (2001), Liang and Wei (2004) provided the fit-viability framework where task-technology fit(TTF) model was applied to the m-commerce applications that added the impact of information technology has on organizations. Their fit-viability framework was suggested as the instrument to diagnosis the success and failure of the m-commerce applications. Then, through the multi-case study, Liang et al. (2007) carried out research on the success and failure of mobile technology application utilizing fit-viability framework. The research verified that the fit-viability model provides meaningful guidelines to corporations in adopting mobile technology.

Killaly (2011) utilized the fit-viability model to identify the possibility of implement cloud computing, while Muhammad et al. (2013) provided crucial guidelines for the adopting and application of corporate system which is developed based on fit-viability model, through which it led to the explanation of the challenges factors for implementing successful enterprise resource planning (ERP) within multi-cultural organizations. Tripathi and Nasina (2017) utilized the Fit and viability concepts of fit-viability model to explain the performance of cloud computing adoption within organizations. Based on the questionnaire results on a total of 16 people from 4 multi-national IT corporations, they carried out research to diagnose the success and failure of adopting cloud computing as well as the implementation of cloud computing for corporation's business, rather than adopting it for specific application. According to the results, cloud computing adoption showed high Fit in terms of task requirements among all firms, while most of the firms had high viability in areas that were related to technology. Such research outcome was helpful for the managerial staff to understand Fit and Viability of cloud computing to carry out their tasks, enabling them to intensify the benefits of cloud computing within their organizations. The success of cloud computing adoption was measured using the performance of adopting cloud computing, and the measurement items were Cloud computing use consist with expectation, User's positive attitude toward cloud computing, Extent to which cloud computing satisfies user needs. Based on the above context, the following research establishes the hypotheses below.

Hypothesis 7: Fit has a positive influence on the Performance of cloud adoption.

Hypothesis 8: Viability has a positive influence on the Performance of cloud adoption.

3. Methodology

3.1. Research Model

The purpose of the following research is the verify how Task Characteristics for business and Technology Characteristics, Economic Feasibility, Technology Readiness, Organizational Factors, Environmental Factors of cloud computing affect the performance of cloud computing adoption through Fit and Viability. The research hypotheses were set up based on previous researches, and the conceptual research model has been designed as shown in Figure 1 below. In this study, the research model has been designed centering around the impacts of Task Characteristics and Technology Characteristics have on Fit, as well as the impacts of Economic Feasibility, Technology Readiness, Organizational Factors, Environmental Factors have on Viability, and finally the impacts of Fit and Viability have on the performance of cloud computing adoption and their relationship.

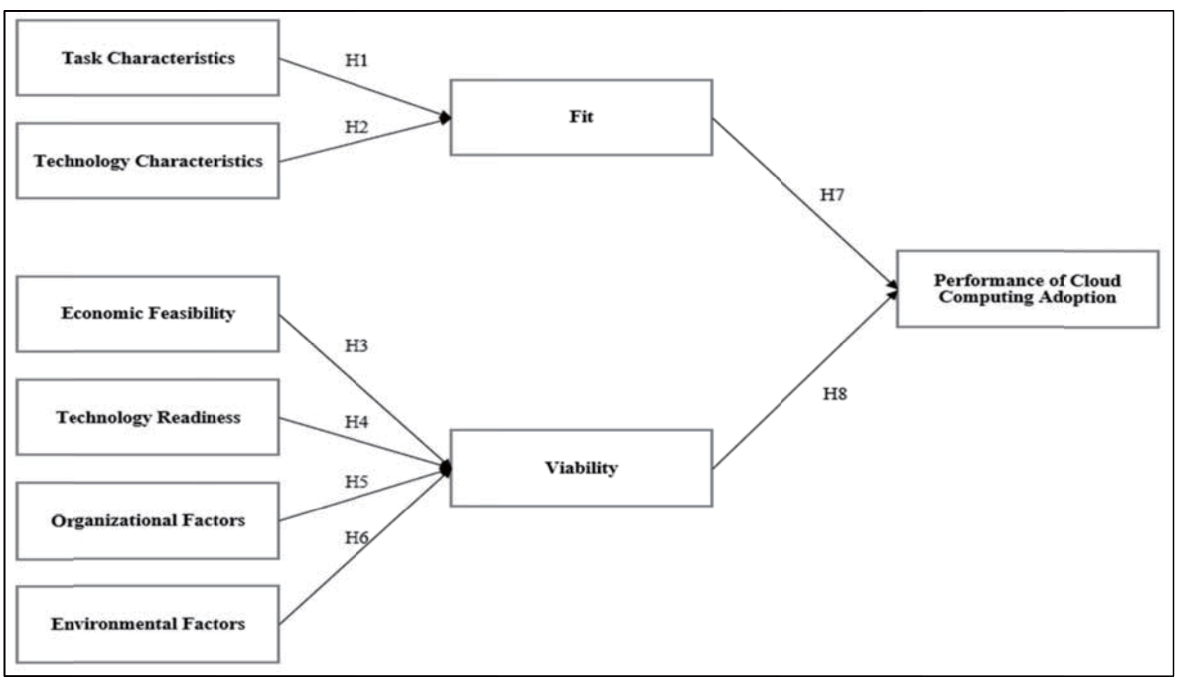

Figure 1: Research model showing the study's hypotheses (H) for Performance of Cloud Computing Adoption.

3.2. Variables and Analytics Approach

The questions of survey were designed with Likert's five-point scale (1 = not at all, 5 = very much/yes). Based on previous research, the operational definition of each and measurement item was designed (Table 1). The Task characteristics and Technology characteristics were selected as independent variables based on the research by Mell and Grance (2011). Task characteristics were composed of two questions: 'agile' and 'cost effective (Margaria & Steffen, 2008; Mell & Grance, 2011; Setia et al., 2008). The Technology characteristics consisted of four components: 'on-demand self-service,' 'resource pooling,' 'rapid elasticity,' and 'measured service (Mell & Grance, 2011). The Economic feasibility, Technology readiness, Organizational factors, and Environmental factors were also defined independent variables to related Viability. The Economic feasibility composed of three questions: 'return on invest', 'saving maintenance costs', 'asset specificity (Alshamaila et al., 2013; Mohammed et al., 2016).

And the Technology readiness consisted of two components: 'IT infrastructure' and 'IT skill of organization (Low et al., 2011; Oliveira & Martins, 2010). The Organization factors consisted of two components: 'employee's knowledge' and 'IT staff's knowledge' regarding cloud computing (Bennett & Savani, 2011; Oliveira & Martins, 2010). The Environmental factors composed of two questions: 'competitive pressure' and 'government regulation (Armbrust, Fox, Griffith, Joseph, Katz, Konwinski, & Stoica, 2010; Low et al., 2011; Oliveira & Martins, 2010; Porter & Millar, 1985). Liang et al. (2007) provided three questions for Fit: 'alignment', 'satisfaction', 'fit the requirements' and two questions for Viability: 'capability and resource support', 'enablement'. Finally, the dependent variable was composed of 'system usage', 'positive attitude', 'satisfaction of user needs (Tripathi & Jigeesh, 2015). The research conducted an interview with total of six experts from three global IT companies and three domestic IT companies. They have experience of decision-making cloud computing adoption and are using cloud computing service in businesses. We checked and refined the research model, hypothesis and variables of the official survey material through the interview feedback.

Table 1: Definition of Terms in the Study

Factors	Operational Definition	Items	References
Task Characteristics	Business task characteristics of IT service base	2	Margaria and Steffen (2008) Setia, Sambamurthy, and Closs (2008) Mell and Grance (2009)
Technology Characteristics	The essential characteristics of cloud computing	4	Mell and Grance (2011)
Economic Feasibility	The economic feasibility like ROI, Asset Specificity	4	Mohammed, Ibrahim, and Ithnin (2016) Alshamaila, Papagiannidis, and Stamati (2013)
Technology Readiness	IT infrastructure and IT skill of Organization for cloud computing	2	Oliveira and Martins (2010) Low, Chen, and Wu (2011)
Organizational Factors	Organizational factors with employee and IT staff's knowledge about cloud computing	2	Oliveira and Martins (2010) Bennett and Savani (2011)
Environmental Factors	Environment factors with Government regulation and Competitive pressure	2	Porter and Millar (1985) Armbrust et al. (2010) Oliveira and Martins (2010) Low et al. (2011)
Fit	The capabilities of cloud computing technology meet the requirement of task	3	Goodhue and Thompson (1995) Liang, Huang, Yeh, and Lin (2007)
Viability	The extent to which the infrastructure of the organization is ready for cloud computing	2	Liang et al. (2007)
Performance of Cloud Computing Adoption	The satisfaction, positive attitude and consistent with expectations with cloud computing systems	3	Tripathi and Jigeesh (2015)

The survey was carried out on executives and staff members of global and domestic IT corporations such as AWS, Cisco, HPE, IMB, MS and Telstra, in particular, those who are using cloud computing for their tasks for 23 days from June 11 ~ July 3, 2018. The survey answers were received from 207 executives and staff members who are currently using cloud computing services at their firms and have an overall understanding on cloud computing. Yet, answers from a total of 198 people were used, excluding those from 9 people which were deemed inadequate. As for the survey method, it was carried out on-line utilizing Google Survey functions. SPSS 25.0 was utilized to analyze the demographic characteristics of the data, technical statistics and normality. AMOS 25.0 was utilized to analyze the measurement model, structural model and indirect effects. The maximum likelihood estimation (MLE) was used as the method for coefficient presumption, and Bootstrapping method was carried out to verify the significance of mediated effects.

4. Results

4.1. Demographics of Respondent

Of the 198 respondents, 84.8% were male, while 15.2% were female. As for their age range, 7.1% were younger than their 20s, 21.1% were in their 30s, 56.5% were in their 40s and 15.2% were in their 50s, showing that those in their 30s and 40s accounted for the majority. As for their educational background, 1.5% were high school graduates, 68.2% had Bachelor's degree, 29.3% had Master's degree while 1% had Doctoral degree. As for their working period, 11.6% had less than five years of experience, 14.1% had 5~10 years of experience, 9.1% had 11 to 15 years of experience, 33.3% had 16~20 years of experience, and 31.8% had over 21 years of experience, with those over 16 years of working experience accounted for 65.1%, taking up the majority of the respondents. As for their affiliation, 54% were working at global IT companies, while 46% worked at domestic IT companies. 68.2% of the respondents were staff while 31.8% were managerial level.

4.2. Verification of Normality

In order to satisfy the hypothesis of multivariate normality, each and every measurement variables of structural equation model must have normal distribution. If this is not the case, exact statistical verification cannot be carried out. When skewness and kurtosis violate the univariate normality by even a bit, normality can be rejected statically, therefore, it's better to evaluate using the amount of the absolute value instead of the statistical verification, and when skewness goes beyond the absolute value of 3 and when kurtosis surpasses 8 or 10, it is deemed to have extreme issue (Kline, 2005). The analysis of the results of accumulated measurement variables are as shown in Table 2. The skewness is below the absolute value of 1.456 and kurtosis was under the absolute value of 2.145, therefore, it can be seen that the basic hypothesis of multivariate normality has been satisfied and can be analyzed by structural equation model.

Table 2: Results of verification of normality

Variables	M	SD	Skewness	Kurtosis
Task Characteristics	4.467	0.689	-1.456	2.145
Technology Characteristics	3.236	1.051	-0.218	-0.77
Economic Feasibility	3.719	0.803	-0.414	0.347
Technology Readiness	3.929	0.924	-0.948	0.816
Organizational Factors	3.838	0.882	-0.512	-0.438
Environmental Factors	3.919	0.765	-0.455	-0.055
Fit	3.742	0.822	-0.293	-0.525
Viability	3.937	0.779	-0.423	-0.344
Performance of Cloud Computing Adoption	3.732	0.778	-0.439	-0.227

4.3. Analysis Results of Reliability and Validity

It has evaluated the reliability and validity of the structural equation model according to the two-step approach (Anderson & Gerbing, 1988). First, we assessed the internal consistency reliability with composite reliability. Second, the convergent validity and discriminant validity were analyzed for the validity of the model. Factor loadings, Cronbach α, Composite reliability indices, and average variance extracted (AVE) were evaluated for convergent validity. And we analyzed the results of comparing values AVE and square of the correlation coefficient. The composite reliability (CR) index of greater than 0.6 is acceptable to have internal consistency reliability (Bhatnagar, Kim, & Many, 2014). Table 3 show the results of reliability and convergent validity of the measurement model. The CR was 0.674~0.899, the internal reliability was secured. Factor loadings value was 0.537~0.937 and this is significant statistically because all t values are 6.0 or higher. The result of Cronbach α was 0.616~0.883 and the average variance extracted (AVE) value was 0.519~0.805.

The values of AVE and correlation coefficients of latent variables are shown in Table 4. The value of the AVE square root of each latent variable is greater than the correlation coefficient of the variables. Therefore, the discriminant validity of measuring tools has been secured (Fornell & Larcker, 1981).

Table 3: Results of reliability and convergent validity test

Category	Variable	Standard Loading Value	Standard Error	t Value	p Value	CR	AVE	Cronbach α
Independent variable	Task Characteristics	0.933				0.890	0.805	0.811
		0.731	0.115	7.069	***			
	Technology Characteristics	0.684				0.843	0.578	0.883
		0.879	0.110	11.205	***			
		0.937	0.117	11.678	***			
		0.749	0.107	9.715	***			
	Economic Feasibility	0.794				0.882	0.714	0.854
		0.920	0.087	13.512	***			
		0.744	0.089	11.078	***			
	Technology Readiness	0.812				0.849	0.739	0.845
		0.901	0.084	12.873	***			
	Organizational Factors	0.868				0.891	0.803	0.876
		0.897	0.068	15.362	***			
	Environmental Factors	0.828				0.674	0.519	0.616
		0.537	0.121	6.662	***			
Parameter	Fit	0.728				0.885	0.722	0.863
		0.877	0.103	11.944	***			
		0.875	0.102	11.920	***			
	Viability	0.869				0.887	0.798	0.845
		0.843	0.064	14.780	***			
Dependent value	Performance of Cloud Computing Adoption	0.738				0.899	0.760	0.868
		0.863	0.099	11.989	***			
		0.888	0.101	12.287	***			

Note: * p < 0.05, ** p < 0.01, *** p < 0.001

Table 4: Correlation Matrix and AVE

Category	AVE	Task Characteristics	Technology Characteristics	Economic Feasibility	Technology Readiness	Organizational Factors	Environmental Factors	Fit	Viability	Performance of Cloud Computing Adoption
Task Characteristics	0.805	0.897								
Technology Characteristics	0.578	0.334	0.760							
Economic Feasibility	0.714	0.249	0.431	0.845						
Technology Readiness	0.739	0.355	0.525	0.356	0.860					
Organizational Factors	0.803	0.269	0.487	0.374	0.542	0.896				
Environmental Factors	0.519	0.262	0.330	0.486	0.393	0.496	0.720			
Fit	0.722	0.330	0.548	0.564	0.542	0.599	0.481	0.850		
Viability	0.798	0.340	0.470	0.468	0.654	0.715	0.567	0.584	0.893	
Performance of Cloud Computing Adoption	0.760	0.310	0.403	0.553	0.474	0.531	0.481	0.669	0.659	0.872

Note: The numbers in bold are the AVE square root values of each variable

4.4. Analysis Results of Structural Model

The results of evaluating the fitness of the structural model was followed. By the fitness standards, the goodness-of-fit index(GFI) was 0.879, which was less than 0.9. However, the comparative fit index(CFI) was 0.954 which was acceptable (Hu & Bentler, 1999). And the adjusted goodness-of-fit index(AGFI) was 0.879 and Root Mean Square Error of Approximation(RESEA) was 0.057, respectively, which were relatively excellent (Brown, 2014; Hu & Bentler, 1999). Based on a comprehensive analysis, the final model is relatively fit.

The hypothesis verification with final model (Table 7) revealed that Task characteristics 0.194 ($p < 0.05$), Technology characteristics 0.531 ($p < 0.001$) all affect Fit positively. Technology readiness 0.315 ($p < 0.001$), Organizational factors 0.325 ($p < 0.01$), Environmental factors 0.361 ($p < 0.01$) all affect Viability positively. The environmental factors were the most influential to the Viability. However, the relationship between Economic Feasibility and Viability was rejected (0.052), showing economic feasibility in theory does not directly affect Viability positively. Fit 0.482 ($p < 0.001$) and Viability 0.482 ($p < 0.001$) all affect Performance of Cloud Computing Adoption in equal amounts positively.

Table 5: Results of Hypothesis Test

Hypothesis (Channel)	Channel Coefficient	*T* Value	*p* Value	Adopted or Dismissed	R^2
hypothesis 1 (Task Characteristics -> Fit)	0.194	2.487	*	Adopted	0.402
hypothesis 2 (Technology Characteristics -> Fit)	0.531	5.904	***	Adopted	
hypothesis 3 (Economic Feasibility -> Viability)	0.052	0.671	0.502	Rejected	0.815
hypothesis 4 (Technology Readiness -> Viability)	0.315	3.550	***	Adopted	
hypothesis 5 (Organizational Factors -> Viability)	0.325	3.072	**	Adopted	
hypothesis 6 (Environmental Factors -> Viability)	0.361	2.979	**	Adopted	
hypothesis 7 (Fit -> Performance of Cloud Computing Adoption)	0.482	6.189	***	Adopted	0.633
hypothesis 8 (Viability -> Performance of Cloud Computing Adoption)	0.482	6.614	***	Adopted	

Note: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

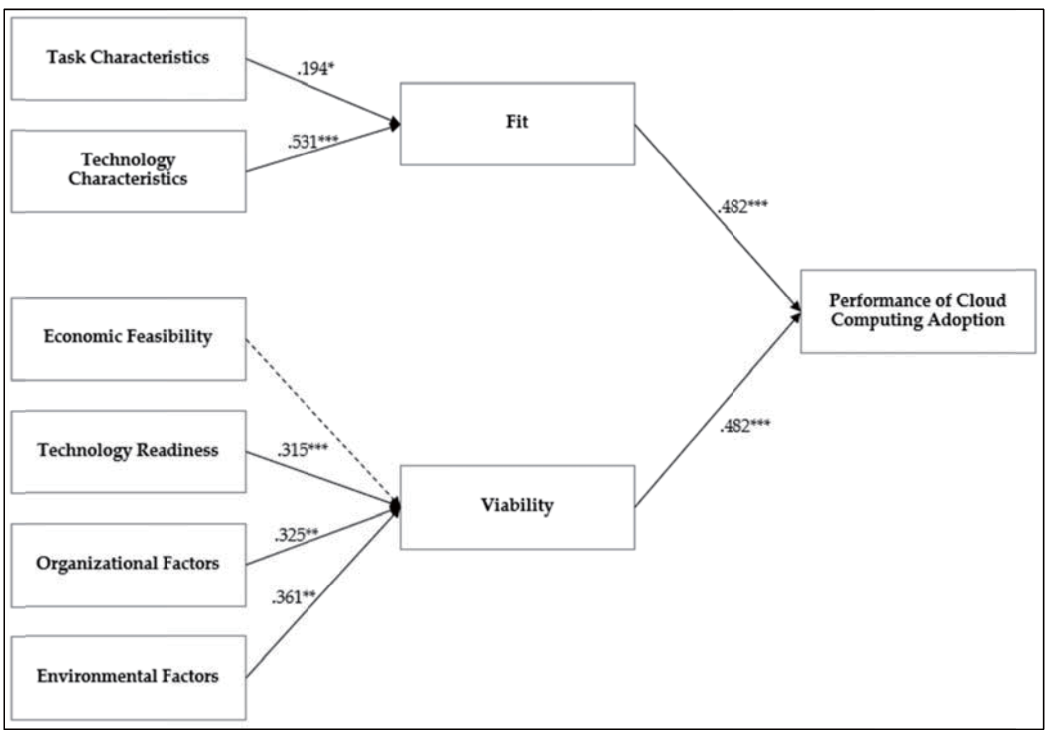

Figure 2: SEM analysis of Research Model (Note: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$)

4.5. Mediated Effect

The bootstrapping method was selected for verifying the statistical significance of the mediated effect. Table 8 shows the results of indirect, direct and total effects. As for Fit, there was a mediating relationship between Task Characteristics, Technology Characteristics and Performance of Cloud Computing Adoption at 0.094 ($p < 0.05$) and 0.256 ($p < 0.05$) level. In case of Viability, the indirect effect was significant with the Technology Characteristics 0.094 ($p < 0.01$) and the Environmental Factors 0.174 ($p < 0.01$), while the Economic Feasibility 0.025 and the Organizational Factors 0.157, meaning that the mediating effect between Economic Feasibility, Organizational Factors, and Performance of Cloud Computing Adoption were not statistically significant.

Table 5: Results of Hypothesis Test

Dependent Variable	Explanatory Variable	Direct Effect	Indirect Effect		Total Effect
Performance of Cloud Computing Adoption	Fit	0.482			0.482
	Viability	0.482			0.482
	Task Characteristics		0.094*	(Fit)	0.094
	Technology Characteristics		0.256*	(Fit)	0.256
	Economic Feasibility		0.025	(Viability)	0.025
	Technology Readiness		0.152**	(Viability)	0.152
	Organizational Factors		0.157	(Viability)	0.157
	Environmental Factors		0.174**	(Viability)	0.174

Note: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

5. Conclusions

The research defined the success of cloud computing adoption as performance of cloud computing adoption, and looked into the impacts and relationships among the factors. First, Task characteristics and Technology characteristics were found to have a positive influence on Fit, through which it had a positive influence on the Performance of cloud computing adoption. Second, it was found that Technology readiness, Organizational factors and Environmental factors had a positive influence on Viability. Above them, Environment factors were found to have a relatively bigger influence, which can be used to conclude that securing competitive edge through the creation of new businesses and related regulations of facilitating the use of cloud by government have relatively more impact on the Viability of firms' cloud computing. However, the hypothesis that Economic feasibility would have a positive impact on Viability was rejected, which shows that currently for firms, the aspect of return on investment(RoI) including investment and maintenance costs as well as asset specificity which include the adoption of new system and employment of new staff do not have a positive impact on the Viability of cloud computing. In addition, it was also confirmed that Technology readiness and Environment factors had a positive impact on the Performance of cloud computing adoption through Viability. However, the hypothesis that Economic feasibility and Organizational factors would affect the Performance of cloud computing adoption through Viability was dismissed. Thirdly, it was confirmed that Fit and Viability had the same amount of impact on the Performance of cloud computing adoption.

In theoretical contribution, first of all, while there were a number of previous researches on the decision-making factors of cloud computing adoption, there were not many researches on the success factors of cloud computing adoption. This research can be differentiated by the fact that it is an empirical research that is carried out based on the experience of the users of cloud services. It is a research that analyses empirically the responses from the staff and executive who work at domestic and international IT corporations that are doing business in Korea, and they can be seen as people who have a good understanding on cloud computing system. And thus, it can be differentiated significantly from the outcomes of conventional research on the success factors of cloud computing that are carried out on the high-level decision makers of corporations. Secondly, environment factors which include the contents of competitive pressure and government regulation were added onto the Fit-Viability Model that was used for previous research on the success factors of cloud computing, and it was confirmed that such environment factors had the largest impact on Viability than all the other factors that have been used in previous research. It is also meaningful that it was confirmed that it had the largest amount of influence on the Performance of cloud computing adoption through Viability.

In managerial contribution, when corporations adopt cloud computing, the understanding on adoption decision making factor is necessary, but an understanding of the impact and relationship of the corporations' cloud computing success factors that have been analyzed through the perspectives of working-level staff who use the actual cloud computing services, just like the outcome of this research, rather than a partial consideration on only the adoption decision-making factors like those research that are done in the perspective of the high-level decision makers of companies, can only be seen to contribute to the success of the adoption of cloud computing by companies.

However, the research has its limitations. First, the survey was carried out on users of cloud computing services at IT companies that are doing business in Korea. The fact that the survey did not include a variety of countries, as well as a variety of companies in industries other than IT can be seen as a limitation. In addition, the study is also limited in that it did not verify the impact and relationship of much more factors, as its effective factors were extracted from the previous researches on the success of cloud computing adoption.

In addition, more empirical research needs to be carried out on the success factors of companies' adoption of cloud computing by utilizing various theories and models related to the success of information services like conventional IS Success model. There is also the need for research on the success effective factors of the adoption of big data system or artificial intelligence system by companies based on the above research on the success effective factors of adopting cloud computing by companies.

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