

## Research on User Adoption Model of Cloud Computing

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*Abstract: The rapid development of cloud computing not only improves the efficiency of users, but also reduces the cost. The factors that influence user adoption of cloud computing include security, reliability, perceived ease of use, perceived usefulness, task, technology fit, and trust. Therefore, this paper studies from two aspects. On the one hand, the key factors that influence the adoption behavior of personal cloud computing are researched and analyzed, and the adoption model of cloud computing user adoption behavior is constructed. The collected data are analyzed by using SSPS statistical software, and then the model is evaluated and corrected. Through empirical analysis, it can be concluded that trust has a positive correlation with the user's adoption of cloud computing behavior. On the other hand, through the results of empirical analysis, the paper puts forward the path and countermeasure of users' adoption of cloud computing in China*

*Keywords: cloud computing, user adoption model.*

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### 1. INTRODUCTION

In recent years, the government, academia and industry have paid more and more attention to the development of cloud computing. As the key technology and means of information system innovation, cloud computing has received high attention. IT companies (such as Google, Microsoft, HP, IBM, Oracle, VMware, SAP and so on) at home and abroad take the development of cloud computing infrastructure and cloud services as its core strategy [1]. Foreign scholars have studied cloud computing related technologies (such as security and reliability technology, new programming mode technology, distributed platform infrastructure technology, etc.), cloud computing adoption, cloud computing applications and cloud computing privacy and so on [2]. However, the main aspects of the research of Chinese scholars are only related to cloud computing technology. There are few studies on the adoption of user cloud and the social problems that cloud computing may encounter. Therefore, according to the characteristics and development background of cloud computing in our country and referring to the experiences and methods adopted by domestic and international

cloud computing, the possible factors affecting the adoption of cloud computing are analysed [3]. The user adoption behavior model of cloud computing is proposed, and the model is analyzed by SPSS and AMOS. Based on data analysis results, the strategy of enhancing user's trust and increasing user's adoption of cloud computing is put forward.

At present, there are few researches about the adoption behavior of cloud computing. Correspondingly, there are few researches on constructing appropriate cloud computing adoption model. To some extent, the traditional factors that influence the adoption of information technology by users can provide some references. Cloud computing is to provide Internet services to users with IT resources such as software, hardware and software development environment [4]. Thus, it changes the supply and usage of information technology. The change of application mode and service mode of this information technology not only brings many technical problems that need to be solved, such as security, reliability and availability, but also brings many economic and management problems. Therefore, this paper analyzes and explains the adoption behavior of user cloud computing, and combines the related characteristics of cloud computing (cloud computing security and reliability) to analysis [5]. According to the characteristics of cloud computing, the main factors that influence the adoption behavior of cloud computing are identified, and the theoretical model is constructed [6]. Then, the data obtained from the investigation are analyzed and validated. This is the great contribution and great progress of cloud computing research, which provides an important reference for understanding the relevant theories and practices of cloud computing. Through the construction of the theoretical model and empirical test, it can be concluded that the important factors affecting the adoption of cloud computing users, as well as the important reason for cloud computing trust. It provides reference for the cloud computing providers, users and regulatory agencies and other related parties [7]. Therefore, this study also has important practical significance.

## **2. STATE OF THE ART**

In foreign literature, scholars have a certain depth and breadth of theoretical and empirical research on the adoption of information technology. On the basis of theory, based on the theories of sociology, psychology and management, the models adopted by various technologies are constructed, such as planning behavior theory, Perceived Characteristics of Innovations (PCI), Social Cognitive Theory (SCT) and innovative diffusion theory. Davis corrects the theory of rational behavior and proposes a technology acceptance model (TAM) for describing the information system users [8]. The main objective is to provide a theoretical basis for the study of the inherent adoption of beliefs by the exogenous variables, and it is a model dedicated to researching the adoption of information system users. Venkatesh and Davis are based on the technology acceptance model to form an extended technology acceptance model (Technology Acceptance Model 2, TAM2). The model takes output quality, user experience and voluntary use as adjustment variables, and analyses it, which enhances the model's explanatory power. Venkatesh and others incorporate TRA, TAM, IDT, TPB, SCT,

MM, C-TAM-TPB (Combined TAM and TPB) and the Model of PC Utilization. The relevant techniques and adoption theories of fusion properties are proposed. The theory suggests that Social Influence, Performance Expectancy, Facilitating Conditions, and Effort Expectancy directly affect behavioral intentions. The user's gender, age, familiarity with the cloud, and number of years of use also affect the user's intention to use cloud computing. Kwon and Zmud proposed the implementation of the Diffusion / Implementation Model based on the innovation diffusion.

In the empirical research, based on rational behavior theory, planned behavior theory and TAM model, the researchers have carried on the empirical analysis to various kinds of information technology fields. Over the past decade, many researches have been made on the adoption of information technology in China [9]. From the adoption of technology and its support business, it mainly focuses on the analysis of the comparative advantages of information technology adoption, influencing factors and models, administrative organization information system, government website, e-government adoption behavior factors and models, enterprise information system, ERP influencing factors and models, as well as mobile business systems, personalized recommendation system and entertainment information system adoption factor analysis. From the theoretical basis of research, based on the technology acceptance model, and combined with the theory and method of economics, sociology, psychology and management, the adjustment factor is identified to extend to TAM, such as adding economic benefits, social norms, psychological factors and leadership support and so on. However, the adoption of cloud computing has only just begun [10]. The adoption of cloud computing by foreign scholars is only a preliminary study, and has failed to systematically study the adoption behavior of cloud users. Benlia empirically analyzes the adoption factors of different application service types: social impact, default attitude, adoption uncertainty, strategic value, and influence adoption behavior of SaaS services [11].

With the joint efforts of all walks of life, the cloud computing platform and cloud computing applications have developed rapidly. Amazon, Google, IBM, Sun and Microsoft and other major cloud computing providers have launched their own research and development of cloud computing applications and service platform. Academics have further studied the cloud computing operating costs, security technology, optimization mechanism and many other issues, and put forward a great theoretical method and extraordinary technical achievements, so that the development of cloud computing has made new achievements. In the world, the relevant research on cloud computing has shown a rapid growth trend. Among them, the largest is North America and Europe. The US government is also actively promoting the development of cloud computing. The development of cloud computing has been greatly improved [12]. Through a variety of ways, the government gives cloud computing support, such as funding cloud computing research and testing, research and publishing cloud computing definition, to open cloud computing applications, to promote cloud standards development. Our governments, industry, and academics recognize many of the problems related to cloud computing, such as cloud computing security and reliability, and the key technical issues of

cloud computing applications. Infrastructure cannot meet the needs of cloud computing, and the cloud computing industry lacks standards. They paid a high price for solving these problems. In a word, this study takes cloud computing enterprise users and their employees as the research object, which can grasp the development law of cloud computing industry. It has important theoretical value and practical significance for promoting industrial development [13].

### **3. METHODOLOGY**

#### **3.1 The Impact of Trust on User Adoption of Cloud Computing Behavior**

Trust has always been one of the most important topics for cloud computing, and many of the studies that have been adopted by cloud computing focus on trust. In other areas of the network, such as e-commerce and virtual communities, they are also beginning to focus on trust [14]. From the research of trust, trust is a complex and multi-dimensional concept. Trust research in the network environment has attracted much attention. It is still necessary to break down trust into different dimensions for in-depth role exploration. This also provides a theoretical basis for the adoption of cloud computing user acceptance behavior model which takes trust as the mediator variable from three dimensions of cloud computing characteristics, technology acceptance model and task technology matching model. A large number of empirical studies show that the trust of users of cloud computing has a significant impact on the adoption of cloud computing behavior. Trust is a belief that users hold on cloud computing, which integrates the cloud computing provider's level, integrity, predictability and other factors. TRA suggests that trust will positively influence user adoption of cloud computing behavior. If the user trusts cloud computing very much, it will lead to adoption of cloud computing. According to the analysis of the above factors and taking into account the various factors and the construction of the model to avoid the complexity of the six latent variables to build the theoretical model is selected, as shown in Figure 1. Safety reliability, perceived usefulness, perceived ease of use, task, technology fit, and trust are latent variables. The adoption of cloud computing behavior is a result variable.

#### **3.2 Model Implementation**

The software used in the validation of this chapter model is AMOS16.0, which is a very usefully software for solving structural equation models. Compared with other software that creates the structural equation model, the advantages of AMOS are: the graphical interface is very simply, the chart of the model is very simple and easy to use. The model of the building model is different, including observable variables, latent variables and the results of the variable; output data and not complicated, easy access. After using the AMOS software to draw the theoretical model, you need to associate with the data in the SPSS software, which is a combination of SPSS software and AMOS software. After running, the path coefficients of the model are shown in Table 1.

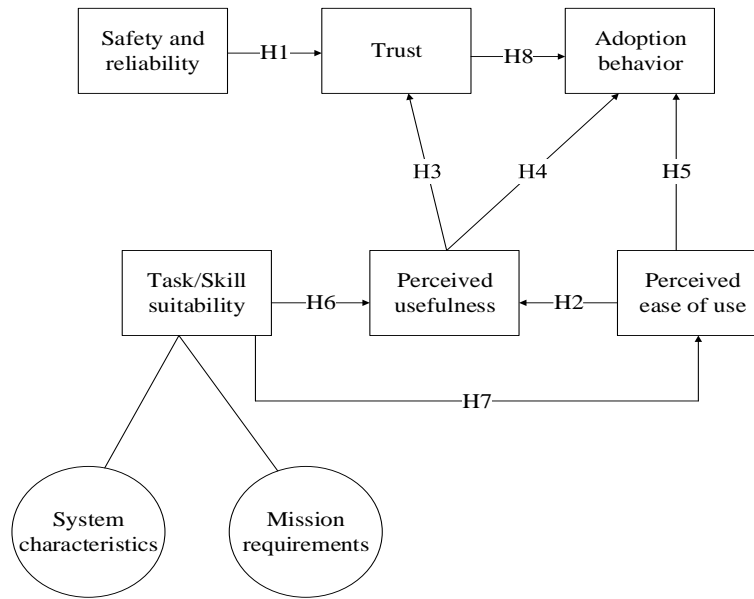


Figure 1. The influential factors model of user adoption behavior in cloud computing

Table 1. Path coefficient

	Estimate	S.E.	C.R.	P
Perceived ease of use and task technology match	0.478	0.251	2.581	0.010
Perceived usefulness and perceived ease of use	0.418	0.179	2.809	0.005
Perceived usefulness and task technical matching	0.573	0.316	2.949	0.003
Trust and safety and reliability	0.540	0.208	2.396	0.017
Trust and perceived usefulness	0.726	0.156	2.898	0.004
Adopt behavior and trust	0.502	0.297	1.741	0.082
Adoption behavior and perceived usefulness	0.213	0.187	0.733	0.464
Adoption behavior and perceived ease of use	0.138	0.180	0.590	0.555

From the above table, we can see that the path coefficient of perceived ease of use is 0.138, that is to say, perceived ease of use is positive even though it is positive, but it is not significant. The perceived ease of use has a significant correlation to perceived usefulness. Therefore, we believe that the correlation between perceived ease of use and behavior is mainly influenced by the perceived usefulness of intermediate variables. At a significance level of 0.05, the absolute value of the critical ratio is greater than 1.96, which is significant. As shown in Table 1, at the significant level of 0.05, the p value of the task technical matching is less than 0.05, which indicates that perceived ease of use is positively related to the matching degree of service technology. Perceived ease of use was less than 0.05 of P, which indicates that perceived usefulness was positively related to perceived ease of use. The p value of the task technology matching is less than 0.05, which indicates that the perceived usefulness is positively related to the matching degree of the service technology. The p value of safety reliability is less than 0.05, which shows that trust is positively related to safety reliability. Perceived usefulness of P is less than 0.05, which indicates that trust is significantly positively related to perceived usefulness.

#### 4. RESULT ANALYSIS AND DISCUSSION

##### 4.1 Result Analysis

Through the analysis of the above section, we can conclude that the matching degree of task technology has a positive correlation with perceived usefulness and perceived ease of use. They are 0.68 and 0.57 respectively. The total impact of task skill matching on adoption behavior was 0.426, but the direct impact was 0, and the indirect effect was equal to 0.426 of the total impact. Therefore, the relationship between task skill fit and adoption behavior is mainly mediated by two intermediate variables: perceived ease of use and perceived usefulness. The total impact of safety reliability on adoption behavior was 0.348, the direct impact was 0. The indirect effect was 0.348, which was equal to the total impact. Therefore, it can be concluded that the security reliability is positively related to adoption behavior through intermediate variables trust. The total effects of each factor on the adoption behavior are shown in Table 2. The direct effects of each factor on adoption behavior are shown in Table 3

Table 2. The total effects of each factor on the adoption behavior

	Perceived ease of use	Perceived usefulness	Trust	Adoption behavior
Task technology fit	0.571	0.796	0.491	0.426
Safety reliability	0	0	0.447	0.348
Perceived ease of use	0	0.209	0.129	0.112
Perceived usefulness	0	0	0.616	0.535
Trust	0	0	0	0.777
Adoption behavior	0	0	0	0

Table 3. The direct effects of each factor on adoption behavior

	Perceived ease of use	Perceived usefulness	Trust	Adoption behavior
Task technology fit	0.571	0.677	0	0
Safety reliability	0	0	0.447	0
Perceived ease of use	0	0.209	0	0
Perceived usefulness	0	0	0.616	0.056
Trust	0	0	0	0.777
Adoption behavior	0	0	0	0

From table 2 and table 3, the total impact of perceived ease of use on adoption behavior was 0.112, and the direct effect was 0. As a result, perceived ease of use does not directly affect adoption behavior, and it requires perceived usefulness through intermediate variables. Here, perceived ease of use is an intermediate variable in the degree of matching of task skills. At the same time, perceived usefulness has a positive influence on adoption behavior through intermediate variables. The total effect of perceived usefulness on adoption behavior was 0.535, and the direct effect was 0.056. It can be seen that perceived usefulness has a positive influence on adoption behavior, and it mainly through the intermediate variable of trust. In fact, even though users perceive cloud computing to be useful, it will not be trusted to embrace cloud computing because of its lack of trust in cloud computing. In addition, the path coefficient of

trust to adoption behavior is 0.78, which shows that trust is positively related to adoption behavior. Therefore, cloud computing vendors can enhance the adoption of cloud computing by increasing the impact of the adoption of various factors affecting the user's cloud computing.

#### **4.2 Countermeasures and Suggestions**

The suppliers should improve the security of cloud computing. Security is one of the most critical factors in cloud computing. If cloud computing providers cannot guarantee the security of cloud computing, the possibility of adoption of cloud computing is relatively small. Here, we propose two ways to increase the security and reliability of cloud computing. First of all, the secure encryption techniques are adopted. Files are encrypted through PGP or corresponding open source products such as True and Crypt. E-mail can also be encrypted by using a network program called Hushmail. Second, the high-quality cloud service providers should be selected. The reputable cloud service providers do not allow users to leave their control, and they don't risk their own brands. As a result, we recommend that users use reputable cloud services.

Cloud computing vendors should improve the usefulness of cloud computing and task technology matching. By analyzing the data of valid samples, perceived ease of use and perceived usefulness have significant positive correlation with user's adoption behavior. Therefore, by enhancing the ease of use and applicability of cloud computing, it is one of the main ways to improve the adoption of cloud computing by users. This study integrates the TAM model and the TTF model and examines the indirect effects of task technology matching on user adoption behavior. It has a positive effect on adoption behavior mainly through perceived usefulness and perceived ease of use. From the point of view of matching information technology with task requirements, the task technology adaptation model improves the efficiency of information technology. The following measures are recommended. The usefulness of users for cloud computing has been improved. Cloud computing vendors make cloud computing web design minimalist, which makes it easy for users to get started. At the same time, it combines user usage procedures. The matching of task technology is improved. By combining user tasks and appropriate technologies, cloud computing vendors enable users to accomplish what they want to accomplish. Cloud computing vendors need to set up a standardized process system that better matches tasks and technologies.

Cloud computing suppliers should increase user confidence in cloud computing. Through empirical research, we can see that trust is the key variable of cloud computing. Therefore, cloud computing providers must increase user confidence. The management of cloud computing should be strengthened. Cloud computing vendors should strengthen supervision and improve the security of cloud services, so as to ensure the availability and authenticity of website information and maintain the credibility of the site. Cloud computing website information is strictly reviewed. False information is not allowed on the cloud computing site. In addition, it is necessary to strengthen the site staff responsibility and enhance the sense of staff service work, and further improve the information management system. Transparency about information management is enhanced. A set of sound management procedures and

systems are developed. They disclose the procedures and systems of their use of information to the user. If the site staff to use the user's information, they must inform the user to make it transparent and standardized. It should improve the service specification of cloud computing. A set of comprehensive cloud computing service rules and regulations have been developed. Suppliers should strictly in accordance with the rules and regulations to provide users with cloud services, so as to ensure the quality of service efficiency and timeliness.

## **5. CONCLUSION**

The research of this thesis explores the user adoption behavior of cloud computing and finds ways to improve the adoption of cloud computing. However, there are many kinds of factors that influence users to adopt cloud computing. Therefore, any relevant research cannot be done very comprehensive. On the basis of TAM and TTF model, the paper analyzes the various possible factors that affect the adoption of cloud computing. The structural equation model is used to analyze the data, and the factors that influence the adoption of cloud computing are significant. However, it is far from enough for the user to adopt cloud computing behavior, because this article only analyzes some key factors that affect the adoption of cloud computing. The theoretical model, research ideas and research methods used in this paper are still to be tested by future research on cloud computing adoption behavior, so as to achieve continuous improvement. In future research, cloud computing adoption behavior also need to continue to test and explore more problems. This is the goal of user acceptance behavior research in cloud computing.

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