ADOPTION MODEL FOR CLOUD COMPUTING TECHNOLOGY

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ABSTRACT

Cloud computing is a rapidly developing phenomenon, that refers to offering IT capabilities and services to users over the Internet in an on-demand fashion. Drawing on Venkatesh et al. 2003 UTAUT model, this study looks at factors that influence’s individuals’ intention to use cloud computing technology. Results of this study indicate Performance Expectancy, Effort Expectancy, and Social Influence to play an important role in encouraging individuals’ intention to use cloud computing technology. The results of this study have theoretical and practical implications.

Keywords: Cloud computing, UTAUT model, Performance expectancy, Effort expectancy, Social influence, Behavioral intention to use.

INTRODUCTION

Cloud computing is a rapidly developing phenomenon in the field of information technologies (IT) for delivering and hosting services over the Internet (Zhang et al., 2010). Cloud computing refers to the capabilities and services of IT that can be leased by an individual user or an organization in an on-demand fashion over the Internet (Rahimli, 2013; Zhang et al., 2010). In a cloud computing environment, the cloud provider manages and leases the computing resource such as CPU, storages, and applications, and the cloud users access these computing resources over the Internet (Rahimli, 2013).

Over the past few years, the development of cloud computing has made a great impact on IT industry, where large companies such as Google, Amazon, and Microsoft have endeavored to deliver more powerful cloud platforms for virtual storage space, communications, and documents creating and sharing (Miseviciene et al., 2011; Zhang et al., 2010). Cloud computing
delivers many exciting features such as low operating costs, cheap and easy access, reduction in business risks and maintenance expense, high scalability, portability, and flexibility that has made it attractive to business owners (Jena and Mahanti, 2011; Zhang et al., 2010).

These features of cloud computing and the involvement of large IT companies in making these features available to business owners have led to lot research into understanding and adopting cloud computing within business organizations (Armbrust et al., 2010; Miseviciene et al., 2011; Rahimli, 2013; Zhang et al., 2010). However, there are not many studies that look into the individual use or adoption of cloud computing. Cloud computing applications by Google and Microsoft such as Google Docs, Google Talk, Office Live, and Windows Live Messaging can offer similar benefits to individual users for improved performance in their work, education, and other endeavors. Thus, the aim of this study is to examine the factors that influence the adoption of cloud computing with regards to individual users.

The remainder of the paper is organized as follows. The next section provides with the research model and the development of hypotheses. In the following sections, we discuss the methodology used, followed by data analysis and results. This is followed by discussion and implications sections. Finally, we conclude with limitations and directions for future research.

**RESEARCH MODEL AND HYPOTHESES**

In order to understand the use and adoption of cloud computing by individual users, we draw on the Unified Theory of Acceptance and Use of Technology (UTAUT) model. The UTAUT model was proposed by Venkatesh et al (2003) to unify eight prominent competing IT acceptance and use models. The UTAUT model was able to explain about 70% of the variance in intention to use IT as compared to other technology acceptance models that were able to explain only about 40% of the variance in intention to use IT, thus indicating UTAUT model to be far advanced in terms of statistical power (Kijsanayotin et al., 2009; Venkatesh et al, 2003). The focus of this study is to examine the factors that influences an individuals’ intention to use cloud computing. Please refer to fig 1 for the research model.

**FIGURE 1: Research Model for Predicting Behavioral Intention to Use Cloud Computing Technologies**

![Diagram of Research Model](image_url)
Performance Expectancy and Behavioral Intention to Use Cloud Computing

Performance expectancy is defined as the degree to which an individual believes that the use of technology will help in improving his/her task performance (Venkatesh et al., 2003). In the context of cloud computing, performance expectancy captures the belief of the ability of cloud computing to deliver the proposed services appropriately, i.e., the value of using cloud computing. Thus, it can be presumed that the advantages of cloud computing such as easy access, flexibility, and scalability as touted by the proponents of cloud computing will encourage the expectancy about performance in using cloud computing. This will further motivate the individuals’ behavioral intention to use cloud computing. Therefore, we hypothesize that

H1: There exists a positive relationship between performance expectancy and the behavioral intention to use cloud computing.

Effort Expectancy and Behavioral Intention to Use Cloud Computing

Effort expectancy refers to the degree of ease associated with the use of IT (Venkatesh et al., 2003). In the context of cloud computing, effort expectancy is about an individuals’ expectations of using cloud computing applications without much effort. The easier it is to access and use cloud computing applications, the more is the intention to use. Therefore, we hypothesize that

H2: There exists a positive relationship between effort expectancy and the behavioral intention to use cloud computing.

Social Influence and Behavioral Intention to Use Cloud Computing

Social influence is defined as the degree to which an individual believes that he/she is expected to use technology as perceived by his/her peers (Venkatesh et al., 2003). Previous studies regarding technology acceptance has shown effect of social influence to significantly affect the intention to use technology (Chang et al., 2007; Karahanna et al., 1999). Thus, if individuals believe that using cloud computing will place them in good standing with their peers and co-workers, then this will increase their behavioral intention to use cloud computing. Therefore, we hypothesize that

H3: There exists a positive relationship between social influence and the behavioral intention to use cloud computing.

RESEARCH METHODOLOGY AND DATA COLLECTION

A survey methodology was used to collect data and for testing the research hypotheses. The items for measuring the constructs were adopted from previously validated instruments. These items were contextualized and used to measure the constructs for cloud computing. The survey items were measured using a five point Likert scale with a (1) indicating “strongly disagree” and a (5) indicating “strongly agree”. A paper based format was used to administer the survey. A convenience sample was used and the respondents were all undergraduate and graduate students from Prairie View A&M University (PVAMU).
The total number of respondents was 70. About 44% of the respondents were male and about 53% of the respondents were female. Around 52% of the respondents had one to five years of experience in IT field. About 6% of the respondents had more than 5 years of experience, and about 40% of the respondents had 1 year or less experience in IT field. Majority of the respondents in this survey were majoring in Information Systems, Accounting, or Management.

DATA ANALYSIS AND RESULTS

We examined the items of the constructs to determine whether they load on the factors on which they are expected to load. In order to examine the measurement properties of the constructs used in the model, we employed a confirmatory factor analysis using the partial least squares technique (Smart-PLS). The Partial Least Square technique offers analysis for structural model and measurement model. The measurement model examines the validity and the reliability of the measures. The structural model evaluates the relationship between the theoretical constructs (Ramakrishnan et al., 2012).

Measurement Model

Convergent validity is evaluated by inspecting the average variance extracted (AVE) of the constructs. The AVE of Social Influence construct was less than 0.5. One of the lowest loading items had to be removed from that construct. After the item was removed the VEs of all the constructs in our model had a value greater than 0.5 (Table 1). This indicates our constructs shows adequate convergent validity (Komiak and Benbasat, 2006).

<table>
<thead>
<tr>
<th>Latent Constructs</th>
<th>AVE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Performance Expectancy (PE)</td>
<td>0.793</td>
</tr>
<tr>
<td>Effort Expectancy (EE)</td>
<td>0.755</td>
</tr>
<tr>
<td>Social Influence (SI)</td>
<td>0.582</td>
</tr>
<tr>
<td>Behavioral Intention to use Cloud Computing (BI)</td>
<td>0.821</td>
</tr>
</tbody>
</table>

For the constructs to exhibit adequate discriminant validity, the correlation among the latent constructs should be lesser than the square-root of the AVEs of the constructs (Komiak and Benbasat, 2006). Table 2 gives the relationship between the correlation among latent constructs (non-diagonal elements) and the square-root of the AVEs (diagonal elements in bold) of all the constructs. From the table 2, it can be seen that our constructs exhibit adequate discriminant validity.

<table>
<thead>
<tr>
<th>Latent Constructs</th>
<th>PE</th>
<th>EE</th>
<th>SI</th>
<th>BI</th>
</tr>
</thead>
<tbody>
<tr>
<td>PE</td>
<td>0.891</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EE</td>
<td>0.522</td>
<td>0.869</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SI</td>
<td>0.493</td>
<td>0.387</td>
<td>0.763</td>
<td></td>
</tr>
<tr>
<td>BI</td>
<td>0.543</td>
<td>0.681</td>
<td>0.492</td>
<td>0.96</td>
</tr>
</tbody>
</table>
The composite reliability of all our constructs were greater than 0.7 (Table 3), indicating adequate reliability (Komiak and Benbasat, 2006).

**TABLE 3: The Composite Reliability for the Latent Constructs**

<table>
<thead>
<tr>
<th>Latent Constructs</th>
<th>Composite Reliability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Performance Expectancy (PE)</td>
<td>0.939</td>
</tr>
<tr>
<td>Effort Expectancy (EE)</td>
<td>0.925</td>
</tr>
<tr>
<td>Social Influence (SI)</td>
<td>0.804</td>
</tr>
<tr>
<td>Behavioral Intention to use Cloud Computing (BI)</td>
<td>0.972</td>
</tr>
</tbody>
</table>

**Structural Model (hypotheses testing)**

We used PLS for testing the research hypotheses. The recommended bootstrapping with a sample size of 500 was used to estimate the significance of the path coefficients (Ramakrishnan et al., 2012). The hypotheses were assessed using a one-tailed t-test because the hypotheses are unidirectional in nature. The path coefficients, t-values, and their respective p-values for the hypothesis is given in Table 4.

**TABLE 4: Path Coeff, T-Test, and Significance**

<table>
<thead>
<tr>
<th>Hypotheses</th>
<th>Path Coeff</th>
<th>T-Test</th>
<th>Sig</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>H1</td>
<td>0.174</td>
<td>1.516</td>
<td>0.065*</td>
<td></td>
</tr>
<tr>
<td>H2</td>
<td>0.509</td>
<td>5.882</td>
<td>0.000***</td>
<td></td>
</tr>
<tr>
<td>H3</td>
<td>0.209</td>
<td>1.659</td>
<td>0.048**</td>
<td></td>
</tr>
</tbody>
</table>

(*p<0.1, **p<0.05, ***p<0.01)

The model exhibits an R-square of 0.545 (Table 4). Thus, about 55% of the variance in the behavioral intention to use cloud computing is explained by our model. Our hypothesis H1 suggests that there exists a positive relationship between performance expectancy and the behavioral intention to use cloud computing. Similarly, our hypotheses H2 and H3 suggests that effort expectancy and social influence positively affects an individual’s behavioral intention to use cloud computing. We found evidence to support all three of our hypotheses. Hypothesis H1 is supported at 0.1 significance. Hypothesis H2 is supported at 0.01 significance, and hypothesis H3 is supported at 0.05 significance. Table 5 gives a summary of the results of the hypothesis testing.

**TABLE 5: Summary of Hypotheses Results**

<table>
<thead>
<tr>
<th>Hypotheses</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>H1 There exists a positive relationship between performance expectancy and the behavioral intention to use cloud computing.</td>
<td>Supported</td>
</tr>
<tr>
<td>H2 There exists a positive relationship between effort expectancy and the behavioral intention to use cloud computing.</td>
<td>Supported</td>
</tr>
<tr>
<td>H3 There exists a positive relationship between social influence and the behavioral intention to use cloud computing.</td>
<td>Supported</td>
</tr>
</tbody>
</table>
DISCUSSION AND IMPLICATIONS

The objective of this study is to determine the factors that will motivate an individual’s behavioral intention to use cloud computing. We draw on UTAUT model to conduct our study. The results of our study indicate that performance expectancy, effort expectancy, and social influence have a positive effect on an individual’s behavioral intention to use cloud computing. Thus, if an individual believes that using cloud computing will improve his/her task performance and also if he/she believes that it is easy to use cloud computing technologies, the individual will be motivated to use cloud computing technologies. Furthermore, if an individual perceives that he/she is expected to use cloud computing by his/her peers then, this will further encourage the individual to use cloud computing technologies.

Theoretical and Practical Implications

This study has both theoretical and practical implications. From a theoretical perspective this study further provides evidence for the validity of the UTAUT model for the adoption and intention to use technology. The results of this model confirm the existence of relationship between performance expectancy, effort expectancy, and social influence towards behavioral intention to use cloud computing and also in the direction as proposed by the UTAUT model. This further offers indication that the UTAUT model is appropriate in understanding adoption of cloud computing technologies.

This study also has practical implications. This study looks at the factors that influence the adoption and usage of cloud computing by individuals. The results of this study provide a guideline for cloud computing providers to encourage end-users into using their applications. Performance expectancy, effort expectancy, and social influence play an important role in motivating individual’s to adopt and use cloud computing technology. Thus, the result of this study suggest that by developing and offering cloud services that are easy to use and help in improving end-user’s task performance, cloud computing providers may be able to increase their customer base.

LIMITATIONS AND FUTURE DIRECTIONS

A convenience sampling methodology is used to conduct this study. This could pose a potential limitation. All the respondents involved in this study were from Prairie View A&M University (PVAMU). Additional research is needed to conclude the generalizability of these results to other populations. Further, this study only looks at behavioral intention to use cloud computing technology. Further research is needed to understand the relationship between intention to use and the actual use of cloud computing technology.

CONCLUSION

Cloud computing is an emerging phenomenon within IT field, that refers to delivering IT services and capabilities over the Internet in an on-demand fashion to organizations and end-users. Drawing on Venkatesh et al. 2003 UTAUT model, this study looks at factors that
influence’s individuals’ intention to use cloud computing technology. Results of this study indicate Performance Expectancy, Effort Expectancy, and Social Influence to play an important role in encouraging individuals’ intention to use cloud computing technology. The results of this study have theoretical and practical implications.

REFERENCES


