

## ANALYSIS OF USAGE OF INFORMATION SYSTEMS AND TECHNOLOGY: CLOUD COMPUTING

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**ABSTRACT.** The objective of the paper was to determine the effect of performance expectancy on the learners' intention to adopt and use Cloud computing. The Unified Theory of Acceptance and Use of Technology (UTAUT) model is used as the basis of this paper, and the data was collected using questionnaires. The questionnaires were analysed for correlation, significance and variance, to study Cloud computing adoption and use based on performance expectancy. The results of the paper revealed that, out of the ten sub-variables, 'Mobile devices are also mediums for learning' made the largest contribution, with 62.1 percent agreeing to the statement. There was a relatively strong positive correlation between the feeling of increased interest in studying using internet devices, and Cloud computing adoption and use. All the sub variables for performance expectancy contributed positively, and they reached the statistical significance of  $p < 0.01$  in terms of contribution.

**Keywords:** performance expectancy, cloud computing, adoption. educational technology

### INTRODUCTION

The term Cloud computing describes the software applications or other resources, that exist online and are available to multiple users via the Internet, rather than being installed on a particular user's local computer (Behrend et al., 2011). Another way to think of Cloud computing is to consider one's experience with email (Chan Gong et al. 2008). "One's email client, if it is Yahoo!, Gmail, Hotmail, and so on, takes care of housing all of the hardware and software necessary to support a person's personal email account" (Walz & Grier 2010: 4).

Cloud computing is becoming increasingly popular as a way to deliver technology to secondary and higher education environments and other organisations. According to a survey conducted among large institutions, half of the respondents in developing countries either had not heard of or did not know what Cloud computing meant (Burt, 2009). Cloud computing is explained as a model for enabling convenient, on-demand network access to a shared pool of configurable computing resources (for example, external links in applications, mobile connections, open systems network mechanisms, applications interconnectivity and multi-protocol support). All these can be provided rapidly and released with minimal management effort or service provider interaction (Walz & Grier, 2010). As storage is provided using a vast remote server, schools can pay a relatively small amount of money compared to the relevant cost of physical hardware, to receive a phenomenal amount of storage space. In this new model, the ICT systems rarely fail. Introducing new curriculum software applications into the classroom

could be a simple and speedy process. When the school principals see ICT as an integral element of teaching and not a necessary evil, then the journey towards using Cloud Computing in education can be led knowledgeably from the top (Cross, 2014).

Cross (2014) accepts that before technology has a chance to really benefit schools, there has to be a fundamental shift in thinking. Technology vendors and service providers must work to reposition ICT within the mind-set of the professionals working in the education sector. ICT departments or county ICT advisers must educate the school principals and teachers by demonstrating the tangible benefits of Cloud Computing to the school system, from a budgetary standpoint and from the ways it improves the educational experience of learners, teachers and parents.

### **Problem Statement**

Cloud computing answers for schools are not evident and fully explored in school contexts than in business environments. Though research is clear that integration of disparate systems is critical in improving initiatives of business organisations, Cloud computing is not developed enough as a platform in South African schools. The research was carried out at East London district, Eastern Cape, South Africa.

### **Context of the Paper and Theoretical Framework**

Performance expectancy is the degree to which using technology will provide benefits to the users in performing certain activities such as completing assignments from home instead of staying after school to use school computers (Venkatesh et al., 2003). The major benefit for any end user is that, Cloud computing can be used simply whenever one needs it (Kunze et al., 2008). It is a pay-as-you-go system. The user school has no physical room necessary for all the hardware to install. Furthermore there are no maintenance costs for all the hardware (Velte et al., 2009). Besides the hardware, it is the applications that provide benefits. The cloud is filled with applications that are ready to use, and more important the data used in this application is always accessible at any place in the world (Vecchiola et al., 2009). Cloud computing allows schools to scale down or upgrade their resource use as the IT conditions change, and thus endows schools with a “high degree of strategic flexibility” (Jljalaly & Monzer, 2012:16). It facilitates space and time savings, remote implementation, mobile business, and is more user-friendly compared to grid systems (Jljalaly & Monzer, 2012). Space savings result from lower physical space requirements since the adoption of Cloud computing translates to less floor space or fewer racks to accommodate machines, servers, and other hardware (Behrend et al., 2011).

### **The UTAUT Model**

A number of theoretical models have been proposed to facilitate the understanding of factors impacting the acceptance of information technologies (Davis, 1989; Chau, 1996; Venkatesh & Davis, 2000). Among these studies, the Technology Acceptance Model (TAM) is one of the most influential and robust in explaining information technology (IT) adoption behaviour. The key purpose of TAM was to provide a basis for discovering the impact of external variables on internal beliefs, attitudes, and intentions. However, the original TAM model was created to examine IT adoption in business organisations. The model’s suitability for predicting general individual acceptance, especially in high schools, needs to be explored. Venkatesh et al. (2003) developed the UTAUT model to consolidate previous TAM related studies. In the UTAUT model, performance expectancy was used to incorporate the constructs of perceived usefulness in the original TAM study.

## Aim of Research

The study attempts to investigate the determinants of Cloud computing adoption and application by high school learners in the East London district. The research was carried out at East London district, Eastern Cape, South Africa. The paper addresses the following objective: To determine the effect of performance expectancy on the learners' intention to adopt and use Cloud computing.

## Research Hypotheses

Based on the statement of the problem and research objective, the following alternative hypothesis ( $H_a$ ) and null hypothesis ( $H_0$ ) are stated:

$H_0$ : Performance expectancy will affect learners' intention to use Cloud computing.

$H_a$ : Performance expectancy will not affect learners' intention to use Cloud computing.

## METHODOLOGY

To have a quantitative approach, the paper used a survey as a method of collecting, processing and analysing data. The research was carried out at East London district, Eastern Cape, South Africa. The nature of predictor variables did not allow manipulation; hence the variables in the paper were investigated in retrospect (Panneerselvam 2008). A descriptive study is used to outline and present circumstances and relationships concerning the research problem. This involves collecting data in order to answer research questions. Data collected through questionnaires was analysed using statistical analysis to answer the research question and verify the null hypothesis. The reported ICT literacy levels were analysed and correlated with each other. The socio-demographic characteristics of the learners included gender, age, grade, residential area, the kind of Internet devices they have, and major subjects studied. The study targeted a population of one thousand and twenty high school learners in the Eastern Cape Province of South Africa, because learners are at the forefront of Cloud computing technology. White (2002:80) suggests that "with any form of research such as surveys, it is usually impossible to question every member of the target population", hence the need for sampling. For the purposes of this study, random sampling was used (Saunders et al., 2007) to examine the determinants of Cloud computing adoption and use by high school learners. A total of 286 questionnaires were distributed to high school learners, and a total of  $n = 116$  useful responses were received, yielding 40.6 percent response rate. The purpose of selecting such a sample was aimed at answering the research questions and meet study objectives. An instrument which gives trustworthy and dependable results is considered reliable (Saunders et al., 2007). The Cronbach's Alpha test was used to test the reliability of the research instrument ( $\alpha = 0.878$ ), to confirm that they concurred with study objectives (Bell, 2005). Responses from the pilot study were analysed for accuracy of meaning and objectivity. An instrument which measures accurately what the researcher expects to measure is valid. A pilot survey was used to test instruments against criterion and content validity benchmarks. There was a need to test the content validity of the research instruments as this ascertained that the items produced the relevant responses from the sample (Mugenda and Mugenda, 2003). The thesis supervisor assessed the relevance of the content in the instruments developed and this advice was incorporated in the revised data collection instrument.

The responses of the learners were analysed using Pearson correlation to determine the effect of performance expectancy on the learners' intention to use Cloud computing. The hypothesis was tested using a one way analysis of variance (ANOVA).

## RESULTS

The following results represent the learners' responses to questions that relate to performance expectancy. Based on research hypotheses, performance expectancy was measured using the following ten sub variables and responses given on a 4-point Likert scale ranging from strongly agree to strongly disagree. The results show a large positive relationship ( $n = 116$ ,  $r = +0.988$ ,  $p = 0.000$ ) between the use of Internet for learning purposes which would save the respondents a lot of time, and more interest in studying because of the use of Internet devices (see Table 1). The results revealed a large positive correlation ( $n = 116$ ,  $r = +0.983$ ,  $p < 0.05$ ) between learners' encouragement to learn more if they could access learning materials anytime, anywhere via mobile devices, and the use of Internet for learning purposes in enhancing the effectiveness of their learning. The results show a large positive relationship ( $n = 116$ ,  $r = +0.960$ ,  $p < 0.05$ ) between more desire that learners would have to use mobile devices as a way of learning, and the mobility which enables the learners to accomplish tasks quickly. A one-way analysis of variance (ANOVA) between groups was conducted to compare the effect of the respondents' use of Internet for learning purposes which would enhance the effectiveness of their learning on the intention to use Cloud computing. There was a significant influence of the respondents' use of Internet for learning purposes which would enhance the effectiveness of their learning, on the intention to use Cloud computing [ $F(3, 112) = 150.697$ ,  $p < 0.05$ ]. There was a significant influence of mobility which enables the respondents to accomplish tasks quickly, on the intention to use Cloud computing [ $F(3, 112) = 53.156$ ,  $p < 0.05$ ]. There was a significant influence of respondents' knowledge of mobile devices as devices for learning, on the intention to use Cloud computing [ $F(3, 112) = 28.863$ ,  $p < 0.05$ ]. There was a significant influence of fixing unexpected problems at the first time of using Internet devices, on the intention to use Cloud computing [ $F(3, 112) = 75.638$ ,  $p < 0.05$ ]. There was a significant influence of more interest to study among learners because of using Internet devices, on the intention to use Cloud computing [ $F(3, 112) = 2274.67$ ,  $p < 0.05$ ]. There was a significant influence of the learners' feeling of being entertained in their studies when using Internet devices, on the intention to use Cloud computing [ $F(3, 112) = 149.919$ ,  $p < 0.05$ ]. There was a significant influence of the ease of learning because of studying anywhere and in, on the intention to use Cloud computing [ $F(3, 112) = 169.963$ ,  $p < 0.05$ ]. A significant level of influence of being more encouraged to learn if they could access materials anytime anywhere via mobile devices, was found on the intention to use Cloud computing [ $F(3, 112) = 131.825$ ,  $p < 0.05$ ]. There was a significant influence of more desire to use mobile devices as a way for learning, on the intention

## DISCUSSION

The results successfully brought out the answer to the research question that the present paper attempted to investigate and explore. The question was as follows: What is the effect of performance expectancy (benefits derived) on the learners' intention to adopt and use Cloud computing? On the other hand, all the  $p$  values for performance expectancy were significant at  $p < 0.05$  under the correlation and analysis and the one way ANOVA. The strength and direction of the statistical relationship imply that performance expectancy is closely associated with the intention to use Cloud. On this basis, the paper failed to reject the first alternative hypothesis that 'Performance expectancy will affect learners' intention to use Cloud computing'. The results obtained from the one-way ANOVA (see Table 2) show that performance expectancy as a construct from the UTAUT model, has a considerable influence on the intention of the respondents to adopt and use Cloud computing, and these are in line with what has been discovered by other researchers (Dulle and Minishi-Majanja, 2011). An examination of the coefficients and correlation matrix analysis was able to indicate that the coefficients of performance expectancy will be significant and contribute to accurate prediction of Behav-

journal Intention if a larger sample size is investigated. Other challenges, such as delivering data outside of the physical network in a secure way to allow pupils access to files for homework, are now fairly standard in Cloud computing. This may sound like a private cloud, but these “clouds” often provide just the required data for learning (Cross, 2014). The paper also confirmed previous technology acceptance studies regarding the strength (high  $r$  values) of the performance expectancy construct in predicting behavioural intention (Louho et al., 2006; Al-Shafi and Weerakkody, 2009). In other words, high school learners are likely to adopt Cloud computing only if they clearly understand the benefits of this mode over the traditional scholarly communication system. If one has ever experienced a server crash on a personal or professional level, it can be a long time while he or she waits for the information to come back. Cloud-based businesses recover data quickly and often handle any technical issues that might arise in a “crash” situation. A word that is often associated with all cloud applications is “redundancy” because the technology eliminates any chance of single-point failure (Lynch, 2014). Processes such as group projects, assignment submission, or even shared lesson plans with other teachers, are streamlined and protected by the cloud. Learners and teachers can confidently collaborate through a shared knowledgebase in real-time and with the most up-to-date information (Sescon, 2014).

## CONCLUSION

This paper found performance expectancy to be significantly influential on behavioural intention, with  $p$  values  $< 0.05$ . Noting that the research was carried out at East London district, Eastern Cape, South Africa. This means performance expectancy has a positive influence on the behavioural intention of the learners to adopt and use cloud computing in their day-to-day learning. Secondly, the hypothesis which states that, performance expectancy will affect learners’ intention to use Cloud computing was not rejected. The results of this paper confirm the previous technology acceptance studies regarding the strength of the performance expectancy construct in predicting behavioural intention. The results of this paper are therefore contrary to those indicating the insignificance of performance expectancy on behavioural intention of technology adoption. In a nutshell; the results indicate that the adoption of Cloud Computing among learners is based on technology features which can make their daily activities easier.

## NOTES

PE1 = The use of Internet for learning purposes would save the me a lot of time. PE2 = The use of Internet for learning purposes would enhance the effectiveness of the my learning. PE3 = Mobility enables me to accomplish tasks quickly. PE4 = I know that mobile devices are also mediums for learning. PE5 = Unexpected problems could be fixed at the first time of using Internet devices. PE6 = I would feel more interested in studying if I could use Internet devices. PE7 = I would be entertained in my studies by using Internet devices. PE8 = Owning an Internet device would ease my learning because it would allow me to study anytime, anyplace. PE9 = I would be more encouraged to learn if I could access materials anytime anywhere via mobile devices PE10 = I would have more desire to use mobile devices as a way for learning.

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