

# Adoption of Cloud Based E-learning in Lebanon: Examining the Mediating Role of Attitude

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## ABSTRACT

Cloud computing (CC) has created a paradigm shift in using technology. Prior literature focused on the adoption of this technology among business organization while studies that are related to educational institutions are few. The aim of this study is to investigate the factors that affect the cloud based e-learning (CBEL) adoption among students in Lebanon. Based on the literature, it is proposed that performance expectancy (PE), effort expectancy (EE), social influence (SI), and user satisfaction affect the behavioural intention (BI). BI is expected to affect the adoption of CBEL. In addition, attitude is proposed to mediate the effect of PE, EE, SI and user satisfaction on BI. The population of this study is four universities in Lebanon. Stratified sampling technique was used to collect the data using a questionnaire. A total of 422 students participated in this study. Data was analyzed using Smart Partial Least Square (PLS). The findings indicated that the user satisfaction is the most important predictors of BI followed by PE, SI, and EE. BI affected use behaviour significantly. Attitude mediated the effects of SI and user satisfaction on BI. Decision makers are recommended to focus on user satisfaction and increase the benefits of CBEL.

**Keywords:** TAM, UTAUT, User satisfaction, Cloud Based E-learning, Higher education

## 1.1 Introduction

Cloud computing (CC) has revolutionized the way of doing business. It was developed during the last decade and it has caused a paradigm shift in Information Technology (IT) (Dempsey & Kelliher, 2018). CC is referred to as a dynamic innovation platform that addresses a wide variety of requirements by giving a digital framework to broaden information storage abilities. Moreover, CC gives access to programming and equipment without substantial capital costs and gives easy access to applications and administrations that can be acknowledged with insignificant service provider interaction (Alkhatir, Walters & Wills 2014). This has empowered CC to create a technological advancement that can deal with large amount of data that are exchanged and stored via means of electronic applications (Dempsey & Kelliher, 2018; Leymann, Fehling, Mietzner, Nowak, & Dustdar, 2011). Organizations have found in CC the solutions that they seek for the cost minimization, efficiency, effectiveness and competitive advantage (Amron, Ibrahim, & Chuprat, 2017). The cost advantages were achieved through virtualization, scalability, and on demand hardware and software (Mohammad 2018). In this sense, most previous studies focused on how to deploy and migrate to the cloud and the requirement for such move (Ramachandran, 2016).

Researchers believe that the biggest challenge of CC is not technological oriented rather, it is related to the perception and attitude of the users (Al-otaibi, 2014; Kayali, Safie, & Mukhtar, 2016b, 2016a). For this reason, many studies focused on the behavioural factors that leads to the adoption of CC. However, the majority of the previous studies were conducted on business organizations addressing the organizational aspect of CC adoption (Al-khatir, Walters, & Wills, 2014; Gupta, Seetharaman, & Raj, 2013; Ratten et al., 2015; Stieninger & Nedbal, 2014). The adoption of CC by educational institutions has not received much attention from researchers (Gohary, Hussin, Zadehgan 2013; Lim, Grönlund, & Andersson 2015). CC enables users such as students to have full access to applications, packages, software, databases, assignment, and projects from inside and outside the campus. In addition, CC is one of the widely used services by students for storing data and entertainment (Behrend, Wiebe, London, & Johnson, 2011). Nevertheless, the widespread of CC adoption and the factors that affect the users' adoption in universities remains unexplored (Huang, 2016; Ratten, 2013).

Theoretical adoption theories and models such as TAM (Davis, 1989) suits well the developed nation but in the case of developing nation such as Lebanon, the model has not been extensively tested (Tarhini et al., 2014). Other models such as UTAUT (Venkatesh, Morris, Davis, & Davis, 2003) was developed to test the individual adoption of technology (Suman et al., 2014; Venkatesh et al., 2003) but the use of the model in CC is still limited (Cao et al., 2013; Nguyen et al., 2014). Meta-analyses studies showed that the literature of CC is dominated by TAM model and 1% have used UTAUT (Senyo, Addae, & Boateng, 2018). Previous studies on the adoption phase of CC has not focused on the usage of the technology in educational settings and studies in this domain are few (Gohary et al., 2013; Lim et al., 2015; Huang, 2016). Most prior studies focused on the adoption of CC in developed countries (Guner & Sneider, 2014). However, due to technological gap between developed and developing countries, more challenges are existed in the latter (Alaaraj, Mohamed, & Ahmad Bustamam, 2018; Mujinga & Chipangura, 2011; Safie & Aljunid, 2013). Thus, it is important to investigate the issues surrounding the adoption of CC to ensure its success (Morgan & Conboy, 2013).

In Lebanon, previous studies and the result of preliminary study showed that universities are using cloud based e-learning (CBEL) with acceptance rate of less than 20%. The main issues that face the students' adoption of CBEL is related to the effectiveness of the systems. Previous studies that have been conducted in the country showed that the acceptance of technology is at the rate of 21% (Tarhini, Hone, & Liu 2015; Tarhini, Scott, Sharma, & Abbasi, 2015). A comparison between Lebanese universities and United Kingdom (UK) universities showed that the first is far behind the

latter in term of using the technology (Tarhini, Scott, et al., 2015). In addition, the studies pertaining to CBEL worldwide are few (Nguyen et al. 2014; Nguyen, Nguyen, & Cao 2014). Accordingly, the purpose of this study is to identify the factors that affect the adoption of CBEL services by Lebanese students. The remaining of this paper discusses the literature, methodology, findings, discussion and implications as well as the conclusion.

## 2. Literature Review

### 2.1 Cloud Computing in Education

Universities, especially in developing countries, are facing challenges in delivering the level of Information Communication Technology (ICT) required to foster the development of learning, teaching, research, and other development activities by typical university (Mohammad, 2018). These ICT requirements are needed by the university to follow up with the advancement in technology and to update their services to match the current technological environment (Okai, Uddin, Arshad, Alsaqour, & Shah, 2014). The need currently are more sever because of the increasing cost of operating the university and the need to provide additional fund to support and maintain the technological infrastructure in university such as the need for updated software and hardware (Sabi, Uzoka, Langmia, & Njeh, 2016).

CC has been proposed as a solution to reduce the operational cost of universities because the CC technology promises users with enhanced IT and availability as well as reliability of these services from anywhere at any time with advantage of paying per use basis (Singh & Chand, 2014). The CC technology has made the services less complicate and increased the speed as well as the quality of IT services provided to users and institutions such as universities. Nevertheless, despite the advantage that are provided by CC, the adoption of cloud is not well investigated in some sector such as the educational sector and higher education still hesitant to start using the technology of CC (Okai et al., 2014).

In higher learning institution, the most widely area of benefiting from CC is the course delivery as well as the distance learning (Xiang et al., 2017). In addition, the daily communication between students and instructors or lecturers are also considered one of the increasingly area of using CC in universities. Recently, one of the indispensable applications that is used by students and lecturers in higher education is the Gmail and its applications such as Google Drive and questionnaire tools (Lim et al., 2015). More application area are also used by students and lecturers are the LMS, library management system, and document storage (Arpaci, 2016). Several stakeholders can benefits from the CBEL. However, the main purpose of developing the CBEL is to serve the students of the university so that the university can attract more students and improve its operations. This study focuses on the students and their adoption of CBEL.

### 2.3 Theoretical Framework

Many theories have been used in previous studies to investigate the adoption of new technology. A meta-analysis study showed that only 4% of studies investigated e-learning have used UTAUT (Šumak, Heričko, & Pušnik, 2011). The authors suggested researchers to investigate the e-learning using different theories such as the UTAUT. In a recent study, a meta-analysis review was conducted on 285 articles published between 2009 and 2015 in leading journals, found that only 1% of the studies have used UTAUT as a theoretical adoption theory while the majority have focused on TAM (Senyo et al., 2018). UTAUT summarized the eight previous theories and model that include TAM and proposed that the adoption of new technology is determined by performance expectancy (PE), effort expectancy (EE), social influence (SI), and facilitating conditions (FC) which expected to affect the behavioural intention (BI) and the use behaviour (UB). According to Venkatesh et al. (2003), perceived usefulness is similar to PE expectancy. In addition, perceived ease of use is similar to EE. The attitude is not mentioned to be equal to any variable in the study of Venkatesh et al. (2003). Thus, in this study, the variable attitude which was used as a mediating variable in TAM to mediate the effect of perceived usefulness on BI is used in this study as a mediating variable among the variables of this study.

### 2.4 Conceptual Framework and Hypotheses Development

The conceptual framework of this study was developed mainly based on the combination between UTAUT and TAM. Variables of UTAUT such as PE, EE, SI are expected to have direct effect on BI. User satisfaction proposed in the Information System Success (ISS) model to be important predictor of technology adoption (DeLone & McLean, 2003) and in this study it is proposed to affect the behavioural intention. Behavioural intention is proposed to have direct effect on the adoption of CBEL. Following the conceptualization of TAM, attitude is proposed to mediate the effect of performance expectancy, effort expectancy, social influence, and user satisfaction on behavioural intention. Figure 1 presents the conceptual framework of this study.

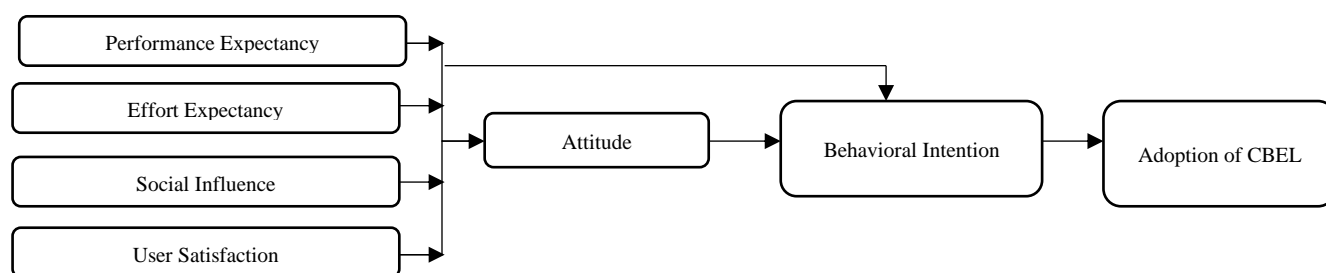


Figure 1: Conceptual Framework

#### **2.4.1 Performance Expectancy and Behavioral Intention**

Several researchers investigate the effect of PE on BI and found significant effect of the variable on the BI to use the technology. For example, Bellaaj, Zekri and Albugami (2015) examined the effect of PE on the intention of continued use of e-learning and found that PE determined the intention to continue using e-learning. Cao et al. (2013) in China found that PE affected the BI to adopt cloud storage by Chinese students. Nguyen et al. (2014) investigated the effect of PE on the adoption of CBEL and found this effect is positive and significant. In this study, it is expected that the effect of PE on the BI toward CBEL is positive and significant. Accordingly, it is hypothesized:

***H1: PE has a significant effect on the BI to use CBEL.***

#### **2.4.2 Effort Expectancy and Behavioral Intention**

Bellaaj et al. (2015) tested the effect of EE on the acceptance of e-learning and found that EE affects significantly the BI to use e-learning. Cao et al. (2013) found that EE affects the intention to use cloud-based storage by students. Nguyen, et al. (2014) found that EE affects the BI to use CBEL. Accordingly, in this study, it is expected that EE has a positive effect on students' BI to use CBEL in Lebanese universities.

***H2: EE has a significant effect on the BI to use CBEL.***

#### **2.4.3 Social Influence and Behavioral Intention**

Al-otaibi (2014) suggested future research to pay attention to the role of friends and peers in CC acceptance studies. Park and Ryoo (2013) found there is a significant and positive effect between SI and BI. Cao et al. (2013) found that SI has significant effect on the students' adoption of cloud storage in China. Nguyen et al. (2014) found that SI affects significantly the BI to use CBEL in Vietnam. This study expects that students will be affected by their peers, friends, family member, social media, and lecturer as well as the management of the university to adopt and use the CBEL. Accordingly, in this study, it is hypothesized:

***H3: SI has a significant effect on the BI to use CBEL.***

#### **2.4.4 User Satisfaction and Behavioral Intention**

User satisfaction with cloud services investigated in few studies (Ding, Wang, Wu, & Olson, 2017). A high quality cloud services is more preferable for active users than low quality services (Ding et al., 2017). DeLone and McLean (1992) developed the ISS. The authors highlighted the importance of user satisfaction with the e-services to adopt the technology. Kang et al. (2013) proposed that user satisfaction with cloud affect the BI to use CC services. Park and Ryoo (2013) found that user satisfaction with the cloud is an important predictor of the intention to switch to CC services. Park and Kim (2014) investigated the effect of user satisfaction on the intention to use mobile cloud services and found the effect is significant. Burda and Teuteberg (2014) found that satisfaction with the technology affects positively the trust as well as the usefulness of the cloud. In this study, it is anticipated that user satisfaction with CBEL affects positively their BI to use the technology. Therefore, it is hypothesized:

***H4: User satisfaction has a significant effect on the BI to use CBEL.***

#### **2.4.5 Behavioral Intention and Use Behavior**

Most of previous theories of technology adoption such as TAM and UTAUT has linked the BI to UB (Davis et al., 1989; Venkatesh et al., 2003). Taylor and Hunsinger (2011) investigated the effect of intention on the use of Google.Doc by university students and found significant relationship. Cao et al. (2013) investigated the effect of BI on UB of CC and found significant effect between the two variables. Several studies have derived similar results (Ali, Nair, & Hussain, 2016; Behrend et al., 2011; Sabi et al., 2016). Therefore, in this study, it is hypothesized:

***H5: BI has a significant effect on the UB CBEL.***

#### **2.4.6 Mediating Role of Attitude**

The original TAM model proposed that attitude can mediate the effect of usefulness on the BI. Verma, Bhattacharyya and Kumar (2018) pointed out the importance of attitude as a mediating variable and suggested that researchers should focus on mediating variables such as attitude to better understand the adoption of technology. Šumak et al. (2011) tested the mediating effect of attitude between ease of use and usefulness and the BI to use e-learning technology. The finding indicated that attitude can play a mediating role. Huang (2016) investigated the factors that affect students to continuously use CC. The finding showed that social and technological factors influenced students' continuous intention via the mediation of attitude toward using. Taufiq-Hail, Ibrahim and Yusof (2017) examined the mediating role of attitude between subjective norms and BI to adopt green CC by individual in Malaysian universities and found that attitude fully mediated the effect of subjective norms on BI. Dai (2016) investigated the adoption of CC services by customers and found that attitude mediated the effect of ease of use, usefulness, and perceived enjoyment on the adoption of CC services. Thus, in this study, it is expected that attitude will mediate the effect of PE, EE, SI, and user satisfaction on BI to use CBEL at Lebanese universities. Therefore, it is hypothesized:

***H6: Attitude mediates the effect of PE on BI to use CBEL.***

***H7: Attitude mediates the effect of EE on BI to use CBEL.***

***H8: Attitude mediates the effect of SI on BI to use CBEL.***

***H9: Attitude mediates the effect of user satisfaction on BI to use CBEL.***

### 3. Methodology

The population of this study is four university in Lebanon. A stratified random sampling technique was used to better represent the university. The use of this technique is due to the differences in the number of students in each university. Due to the concern of low response rate when distributing online survey, 790 questionnaire were distributed online. A questionnaire is the research instrument of this paper. The questionnaire consists of three main sections. In the first section, a cover letter and introduction to the questionnaire is given. In the second section, the background of the respondents such as their age, gender, education and tools of using CC. Third section seeks to find information related to the variables of the study. The items are evaluation based on five Likert scale where (1) is strongly disagree and (5) is strongly agree. Performance expectancy (5 items), effort expectancy (5 items), social influence (5 items) were adapted from Venkatesh et al. (2003) and Lian (2015). User satisfaction (4 items) was adapted from Park and Kim (2014), attitude (4 items) was adapted from Al-otaibi (2014), behavioral intention (5 items) was adapted from Park and Ryoo and Lian (2015). Adoption of CBEL (6 items) was adopted Venkatesh et al. (2003).

The questionnaire was validated by experts and pilot study was conducted prior to field data collection to assess the reliability of the measurement. The data was collected from 459 students in four universities in Lebanon. A total of 37 questionnaire were removed due to missing value and outliers resulting in 422 complete and usable questionnaires. This data are sufficient for the purpose of analysis. Previous studies used similar amount of data to analyze using Smart PLS (Alaarj, Abidin-Mohamed, & Bustamam, 2016; Alaarj, Mohamed, & Bustamam, 2017; Alaarj, Zainal, & Bustamam, 2015). The data was normally distributed and no multicollinearity issues among the variables.

### 4. Findings

#### 4.1 Background of the Respondents

The age of the respondents, (66.6%) are less than 23 years old with 54% are males with bachelor degree and they use smartphone to access the CBEL.

#### 4.2 Measurement model

Hair et al. (2014) suggested researchers to assess the measurement model by confirming the convergent validity, discriminant validity as well as factor loading ( $>0.70$ ), composite reliability (CR) and Cronbach's Alpha (CA) ( $>0.70$ ). The convergent validity is achieved when the average variance extracted (AVE) is greater than 0.50. The factor loading was checked and all the loading are greater than 0.70. In addition, CA is greater than 0.70 as well as the CR is greater than 0.70. The convergent validity is achieved because the AVE for all variables is greater than 0.50. The discriminant validity were achieved because the value of square root of AVE are greater than the cross loadings.

#### 4.3 Structural Model

The structural model is assessed by the R-square as well as the predictive relevance ( $Q_2$ ), effect size ( $f^2$ ), and path coefficient (Hair et al., 2014). The value of R-square 0.25, 0.50, 0.75 is considered weak, moderate, and substantial respectively. Value of  $Q_2$  should be greater than zero and it is obtained by conducting blindfolding analysis. Acceptable value of  $f^2$  is greater than 0.02 (Hair et al., 2014).

#### 4.4 Hypotheses Testing

##### 4.4.1 Direct Effect Hypotheses

The direct effect of PE, EE, SI, and user satisfaction on BI is presented in Table 3. In addition, the table shows the direct effect of BI on UB. Table 1 shows the coefficient ( $\beta$ ), Standard Deviation (STDEV), T-statistics (T Values), P values (P), effect size ( $f^2$ ), predictive relevance ( $Q_2$ ), and R-square ( $R_2$ ). The Table shows that 36.7% of the variation in BI can be explained by PE,EE,SI, and US. In addition, 19.4% of the variation in UB can be explained by BI. The independent variables can predict the dependent variable because the  $Q_2$  is greater than zero for BI and UB. Further, the  $f^2$  for all the causal effect are acceptable.

Table 1: Direct Effect Hypotheses

Hypothesis No.	Path	$\beta$	STDEV	T Values	P Values	$f^2$	Remark
H1	PE→BI	0.162	0.054	2.986	0.003	0.02	Supported
H2	EE→BI	0.145	0.047	3.062	0.002	0.02	Supported
H3	SI→BI	0.151	0.050	2.991	0.003	0.02	Supported
H4	US → BI	0.305	0.042	7.195	0.000	0.11	Supported
H5	BI→UB	0.440	0.040	10.869	0.000	0.24	Supported
$R_2$ for BI is .367, for UB is .194 $Q_2$ for BI is .272, for UB is .143							

Note: BI: behavioral Intention, UB: use behavior, US: user satisfaction, PE: performance expectancy, EE: effort expectancy, SI: social influence.

The first hypothesis predicted the effect of PE on BI is significant. The prediction is true. PE affect significantly BI ( $\beta=0.162$ ,  $P=0.003$ ). Thus, H1 is supported. H2 assumed that EE has a significant effect on BI. The assumption is true. EE affects BI significantly ( $\beta=0.145$ ,  $P=0.002$ ). Therefore, H2 is supported. For H3 and H4, they are supported because the effect of SI on BI is significant ( $\beta=0.151$ ,  $P=0.002$ ) and the effect of US on BI is significant ( $\beta=0.305$ ,  $P<0.001$ ). for H5, the effect of BI on UB is significant ( $\beta=0.440$ ,  $P<0.001$ ). Thus, H5 is supported.

#### 4.4.2 Mediating Role of Attitude

The result of testing the mediating role of attitude was shown in Figure 2. The  $R^2$  of the model increased to 0.474 indicating that a total of 47.4% of the variation in BI can be explained by the IV and the mediator. Further, the  $Q^2$  is greater than zero indicating that the variables can predict the AT and the BI. The method to evaluate the mediator is to compare the direct effect with the indirect effect. In case the direct effect reduced and stayed significant, a partial mediation is assumed. However, if the direct effect reduced and turned insignificant, a full mediation is assumed providing that in both cases, the indirect effect should be significant. The results in Table 4 indicate that attitude did not mediate the effect of PE and EE on BI. This is because the indirect effects are not significant. Thus, H6 and H7 were rejected. Further, H8 and H9 were supported due to the fact that the direct effect reduced and stayed significant. In addition, the indirect effects through attitude are significant. Thus, a partial mediation occurred. H8 and H9 are supported.

#### 5. Conclusion, Limitation, Future Work

This study was conducted to examine the effect of the variables of UTAUT as well as the attitude and user satisfaction on the BI to adopt CBEL among students in Lebanon. Based on a combination between TAM and UTAUT as well as ISS, the study proposed that PE, EE, SI, and user satisfaction affect the BI. BI was proposed to affect the UB. In addition, attitude was proposed to mediate the effect of PE, EE, SI, and user satisfaction on BI. The data was collected from students at four universities in Lebanon. Findings indicated that user satisfaction is the most important predictor of BI followed by PE, SI, and EE. BI affected UB and attitude mediated the effects of only SI and user satisfaction on BI.

Findings of this study can be generalized on the population due to the use of random sampling. However, all the universities included in this study are private. Thus, for better generalization, a study on public universities is recommended. The study collected data from students. Thus, future studies are recommended to examine the academic and non-academic staff. Further studies are also recommended to examine the technological factors such as privacy, security, and trust. In developing countries, internet speed and connection are essential. Thus, technical factors such as availability, coverage, Internet speed and connection could be an area of focus for future studies in the developing countries.

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