Towards the Acceptance of RSS to Support Learning: An empirical study to validate the Technology Acceptance Model in Lebanon

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Abstract: Simpler is better. There are a lot of "needs" in e-Learning, and there's often a limit to the time, talent, and money that can be thrown at them individually. Contemporary pedagogy in technology and engineering disciplines, within the higher education context, champion instructional designs that emphasize peer instruction and rich formative feedback. However, it can be challenging to maintain student engagement outside the traditional classroom environment and ensure that students receive feedback in time to help them with ongoing assignments. The use of virtual learning platforms, such as Blackboard Learn, and web feed syndication, using technology such as Rich Site Summaries (RSS), can help overcome such challenges. However, during an initial pilot at an institution in Lebanon, only 21% of students reported making use of both these facilities. In this study, the Technology Acceptance Model (TAM) was used to guide the development of a scale to be used to investigate antecedents to the use of web feeds. The proposed scale was reviewed by 4 experts and piloted with 235 students. The collected data were analysed using structural equation modeling (SEM) technique based on AMOS methods. The results revealed adequate face, content, and construct validity. However, perceived ease of use was not a significant predictor of attitude towards use. Overall, the proposed model achieves acceptable fit and explains for 38% of its variance of which is lower than that of the original TAM. This suggests that aspects of the model may lack criterion validity in the Lebanese context. Consequently, it may be necessary to extend the scale by capturing additional moderators and predictors, such as cultural values and subjective norms. We concluded that the existence of RSS feeds in education improves significantly the content presented by the instructors to the e-learning user decreasing at the same time the size and access cost.

Keywords: really simple syndication, rss feeds, technology acceptance model, technology adoption, e-learning, structural equation modeling, developing countries, Lebanon

1. Introduction

With the rapid development of internet and technology, universities and higher educational institutes around the world, including Lebanon, have begun to focus on the benefits of using e-learning systems as part of improving their teaching and learning activities (Tarhini, Hone and Liu, 2013a; Teo and Noyes, 2011; Ngai, Poon and Chan, 2007). E-learning has many definitions; the definition is usually based on the contexts and environments where it operates (Kanthawongs and Kanthawongs, 2013). In this research, e-learning is defined as learning facilitated and supported through the use of internet technology to deliver information to students with interactions through computer interfaces in order to supplement traditional method of learning (classroom lectures). This way of teaching and learning is also known as 'blended learning'. One of the major benefits that e-learning systems offer is shifting the focus from instructor-centred to student-centred and the flexibility of time and place in an active manner (Arenas-Gaitán, Ramírez-Correa and Javier Rondán-Cataluña, 2011).

Despite the perceived benefits of using e-learning systems, however, the lack of portability and pervasiveness of these systems can negatively influence peer interaction, resource acquirement, and content delivery (Cold, 2006; Lan and Sie, 2010). In the past, instructors and managements used either Email or SMS as a communication channel to notify the students about the latest learning activities such as new updated material, or new discussion topic (Markett *et al.*, 2006; Liu, Liao and Pratt, 2009; Meurant, 2007). However, these two communication channels have some drawbacks. For example, SMS has content limitations in terms of the maximum allowed characters (Markett *et al.*, 2006), while the content delivered by Email does not

automatically inform the student in a real time to acquire the latest news (Sun and Cheng, 2007). Recently, web-based learning systems have started to integrate Really Simple Syndication (RSS) techniques as a new information delivery mechanism to improve learning performance (Lan and Sie, 2010; Shim and Guo, 2009).

RSS is a lightweight XML application which summarizes website information. RSS feeds allow the users to be notified when the content of certain data on the web has changed, and was made available to the general public in 1999 (Cold, 2006). Thus, RSS provides learners a means to get the latest updates immediately on Internet-enabled devices (West *et al.*, 2006). In other words, RSS provides a one place stop for each module (the syndication) (Hrastinski, 2008). RSS is better because it can be easily used from mobile / web-browser; it is not explicitly a push technology (as browsers pull from server on request) but provides a convenient means to do so (Tarhini et al., 2015a, b). Moreover, RSS formats allow relatively low-bandwidth data gathering. RSS is also important to e-Learning developers because with such technology, it is possible to create and use repositories of learning objects on the public Internet or on a private intranet. Additionally, RSS solves lot of problems that other communication channels (e.g., Email) commonly face, such as spam, increasing traffic and advertising websites (Lan and Sie, 2010). In other words, learners will only receive relevant information and materials related to their learning activities since the instructor can describe and syndicate the content of posted materials (Duffy and Bruns, 2006). Consequently, it serves towards informing learners about the latest learning opportunities in real time, including: new teaching material; course announcements; new reading material; and new topics for discussion. This has been shown to enhance the communication among peers (Prabowo, Thelwall and Alexandrov, 2007; D'Souza, 2006) and help learners track conversation topics (Richardson, 2005). RSS feeds has the potential to be used for public-opinion gathering and can also improve student research by providing access to compilations of in-depth research references with only a few simple clicks and therefore helps the students to remain engaged and ensures the timely delivery of feedback from instructors (Asmus *et al.*, 2005; Fernandez, Simo and Sallan, 2009). RSS can also make part or all content of posted materials available for use by other applications through a feed, which in turn make it available on many different devices, including wireless ones. Thus, RSS provides portability and pervasiveness to virtual learning environments in a way which facilitates collaboration and the dissemination of the latest information, since it gleans relevant information related to user's needs (Cold, 2006).

Although RSS feeds are widely used in many advertising sites and organizations, the use of RSS in education entails the problem of students' low acceptance and usage (Cold, 2006). As a new technological-pedagogical practice, the technology has the potential to enhance pedagogy when students understand it as another means to improve their education and achieve their learning goals. But, despite the widespread deployment of RSS feeds, there is a high level of resistance to use and accept such technologies due to the asynchronous nature of such interaction; however, it can be challenging to motivate self-regulated learning beyond the traditional classroom environment (Park, 2009). It is essential to consider the students' acceptance and adoption of technology; otherwise the e-learning system will be underutilized or completely abandoned (Liu *et al.*, 2009; Park, 2009). Therefore, it has become imperative for practitioners and policy makers to better understand the factors that influence the adoption of RSS as a suitable information delivery medium, since it is considered the most major step toward implementing and developing a successful e-learning environment (Teo, 2010a).

Several models and theories have been developed in the past three decades to examine and predict the acceptance levels of specific technologies. Examples include: the Technology Acceptance Model (TAM) (Davis, 1989); the Theory of Reasoned Action (TRA) (Ajzen and Fishbein, 1980); Innovation Diffusion Theory (IDT) (Rogers, 1995); the Theory of Planned Behaviour (TPB) (Ajzen, 1991); and the Unified Theory of Acceptance and Use Technology (UTAUT) (Venkatesh *et al.*, 2003). This study employed TAM in order to understand and explain the relationship between individuals' perception (such as perceived ease of use, perceived usefulness of the e-learning system) and behavioural intention (see Figure 1). Among other models, TAM is considered the most cited model in the IS research (Yousafzai, Foxall and Pallister, 2007; Bagozzi, 2007) due to its acceptable explanatory power and parsimonious structure (Venkatesh and Bala, 2008).

A number of researchers have examined TAM to explore its validity and reliability across different technologies and usage contexts (Teo and Noyes, 2011; Park, 2009). A criticism, however, is that TAM can be affected by biases in cross-cultural contexts e.g. (McCoy, Everard and Jones, 2005; Teo, Luan and Sing, 2008; Rose and Straub, 1998; Straub, Keil and Brenner, 1997). Therefore, since Davis (1989) did not consider potential biases across different cultural settings, it is important to validate scales in cross-cultural research to ensure

measurement invariance. However, while there are a considerable number of TAM studies that focus on developed countries, TAM has not been widely tested in developing countries (Teo *et al.*, 2008). Consequently, Teo (2010b) emphasizes the importance of testing the TAM in different cultures to ensure adequate reliability and validity. Additionally, the TAM predicts whether users will adopt a general purpose technology, without focusing on a specific topic (Pituch and Lee, 2006). In contrast, this study extends TAM by focusing on specific topics and exploring the behavioral intention to use e-learning technologies, since the applicability of TAM is limited in the educational settings as much of the research has been carried among end-users in the business settings (Kung-Teck, Osman and Rahmat, 2013; Teo et al., 2008).

Furthermore, the argument that TAM model doesn't serve equally across cultures and the inconsistency in previous studies' results (Gefen and Straub, 1997; McCoy *et al.*, 2005; Srite and Karahanna, 2006; Straub *et al.*, 1997) highlight the importance of conducting this research in the Lebanese context. Lebanon remains relatively unexplored in terms of technology acceptance and the investment in technology in the educational system is still immature compared to western countries since universities and higher education institutions support traditional styles of pedagogy in education due to the lack of financial resources or trained staff (Baroud and Abouchedid, 2010; Nasser, Khoury and Abouchedid, 2008; Nasser, 2000),which in turn limited the adoptions and acceptance level of technology within such countries.

This research aims to contribute to the stream of literature on e-learning and technology acceptance by applying the TAM to examine the individual students' perceptions towards the acceptance and adoption of RSS feeds in the Lebanese context. Specifically, this study will examine the relationship between students' behavioural intention to use RSS feeds in education with selected factors of perceived usefulness, perceived ease of use, and attitude towards usage of the system. This will help the researcher to examine the external validity of western developed theories in non-western countries as well as its robustness and applicability in the context of e-learning. To the best of the author's knowledge, this research is one of the first studies that empirically and theoretically test the TAM in the context of RSS feeds in Lebanon. Therefore, the present study offers a deeper understanding of the interplay between student characteristics and the usability and interactivity of e-learning environment from a cross-cultural perspective. By establishing a better understanding of the reasons for accepting or rejecting the RSS as a suitable information delivery medium in education by Lebanese students, it is hoped that policy makers can improve the students' learning experience in using the system that has been developed specifically to respond to current demands of their education (Abbasi et al., 2011).

This paper is structured as follows. In section 2, a summary of literature about the TAM and its development is provided. It is then followed by proposing the research model and describing the research hypotheses in section 3. Section 4 presents the research method that guided the research. Section 5 illustrates the data analysis and results of the measurement and structural model. Finally, section 6 discusses the main findings of the study and concludes the paper with its corresponding implications and limitations.

2. Research Model and Hypotheses

This study employs the TAM for its predictive ability in studies involving students (Teo, 2009b; Kiraz and Ozdemir, 2006). TAM is arguably the most popular model in technology acceptance studies (McCoy, Galletta and King, 2007; Venkatesh and Bala, 2008). Considering the Pros and Cons of the Theory of Reasoned Action (TRA), Davis (1989) proposed a widely accepted theory for representing the technology acceptance behaviour in IT domain. The model was mainly developed to explain computer-usage behaviour and factors associated with acceptance of technology. The TAM states that the success of a system can be determined by user acceptance of the system, measured by three factors: perceived usefulness (PU), perceived ease of use (PEOU), and attitudes towards usage (ATU) of the system (Davis, 1989). Perceived usefulness (PU) is defined as "the degree to which a person believes that using a particular system would enhance his or her performance" (Davis, 1989). Perceived ease of use (PEOU) refers to "the degree to which a person believes that using a particular system would be free of effort" (Davis, 1989). Perceived usefulness and perceived ease of use can be considered as cognitive factors, whereas Attitude towards usage (ATU) refers to the "the degree to which an individual evaluates and associates the target system with his or her job" (Davis, 1989).

According to Venkatesh et al (2003), TAM presumes that system usage behaviour is predominately explained by BIU that is formed as a result of conscious decision-making processes. The user's perceptions about the system's usefulness and ease of use result in a behavioural intention towards using (or not using) a certain

technology (Davis, et al., 1989). In TAM, PU and PEOU tend to have a direct impact on user's attitude towards the system (ATU), which in turn have a direct impact on BIU (Chang and Tung, 2008; Teo and Lee, 2008). In addition, PEOU has also been shown to significantly influence PU (Rodriguez and Lozano, 2011; Teo, 2009a; Liu *et al.*, 2010).

The BIU is an important factor that will actually utilise the system. By manipulating these factors, users' beliefs about the system, and subsequently, their behavioural intention and usage of the system will be determined. Figure 1 depicts the causal relationships between PU, PEOU, ATU, and BIU which are specified in the TAM to reflect the students perceptions about using the RSS feeds on Blackboard system to support their education.
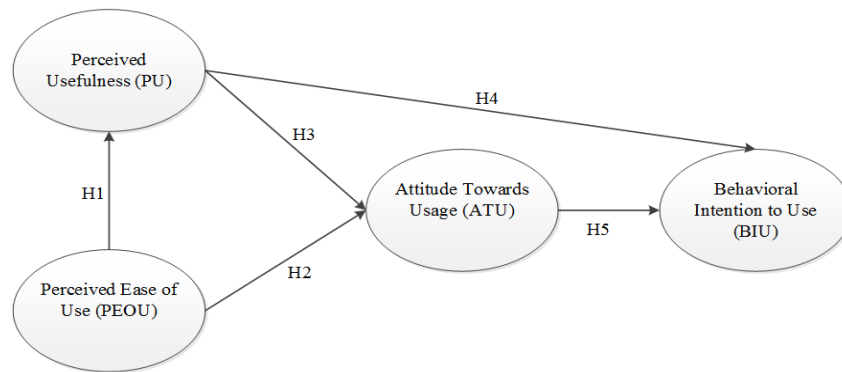

Figure 1: Research Model of this study (Davis, 1989)

In accordance with the research objective and consistent with previous research on TAM and related work, this study tested the following hypotheses:

H_1: *perceived ease of using RSS feeds (PEOU) will have a direct significance positive influence on the perceived usefulness of RSS feeds (PU) in the Lebanese contexts.*

H_2: *perceived usefulness of RSS feeds (PU) will have a have a direct significance positive influence on students' attitude towards the benefits of using RSS (ATU) in the Lebanese context.*

H_3: *perceived ease of using RSS feeds (PEOU) will have a direct significance positive influence on students' attitude towards the benefits of using RSS (ATU) in both the Lebanese context.*

H_4: *Students' perceived usefulness of RSS feeds (PU) will have a direct significance positive influence on intention to use RSS feeds available on Blackboard Learn (BIU) in the Lebanese context.*

H_5: *Students' attitude towards the benefits of using RSS (ATU) will have a direct significance positive influence on students' behavioural intention to use the RSS feeds available on Blackboard Learn (BIU) in the Lebanese context.*

3. Methodology

1.1 Research Design

This study employs a structural equation modeling (SEM) approach based on AMOS 20.0 to examine the causal relationships and to test the hypotheses between the observed and latent constructs in the proposed research model. SEM has the two main advantages over the use of traditional statistics (e.g, regression). First, SEM has the ability to test the relationships between a serious of independent and dependent constructs simultaneously, and especially where a dependent variable becomes independent (in our case PU and ATT), and second, measurement errors are modelled and computed in SEM to facilitate more precise estimation of item reliability, and thus achieve a good model fit after analysis and modifications (Hair et al., 2010). This study employed two-steps approach during the data analysis process. In the first step, the confirmatory factor analysis (CFA) was employed to assess the constructs' validity and test the model fit. The next step employed the structural equation modeling (SEM) technique to test the hypothesized relationships among the independent and dependent variables. Using a two-step approach assures that only the constructs retained from the survey that have good measures (validity and reliability) will be used in the structural model (Hair *et al.*, 2010). The sample size of this study was determined based on the rules of thumb for using SEM within

AMOS 20.0 in order to obtain reliable and valid results. Kline (2010) suggested that a sample of 200 or larger is appropriate for a complicated path model. He also advised that in multivariate research (e.g., SEM); the required sample size should exceed by several times (preferably 10 times) the number of variables within the proposed framework or study. Considering the complexity of the model which takes into account the number of constructs and variables within the model, our sample size (235) meets the recommended guidelines.

1.2 Sample and Procedure

A self-report questionnaire was used in this study. Data were collected from 235 students at the end of the academic year(June and July) of 2012 using a convenience sample. Participants were recruited from a range of teaching units at a higher education institution in Lebanon. All participants were studying in an English-language setting and were assumed to be computer-literate. This is because the courses offered by the institution were predominantly technology, engineering and social science based. The virtual learning environment, Blackboard Learn, was also used for most courses, as an institutional policy. All participants were volunteers. No academic credit or financial incentives were provided. As per ethics policies, all potential participants were briefed about the nature of the work and were required to provide explicit consent. On average, each participant took around 11 minutes to complete the questionnaire. Among the 235 returned questionnaires, the average age of the participants was 21.3 years and 48.5% of the participants were female. Approximately, 41% of participants were enrolled on postgraduate modules using RSS feeds, while 59% were on undergraduate modules using RSS feeds. All the participants owned a computer or laptop at home and were mostly found to be experienced in using computers and Internet.

1.3 Measurement scales

Although the questionnaire items were extensively used in previous research related to Technology Acceptance Model, however, there has been some concern over the direct use of the adaptation and application of the Technology Acceptance Model in the context of developing countries such as Lebanon. Therefore, prior to further study, the questionnaire was sent to four experts in technology adoption in order to establish face validity, and then the questionnaire was pilot-tested with 32 students randomly chosen in order to establish content validity and reliability. Some items were reviewed and modified based on the pilot test results.

The final questionnaire consisted of two sections. Section one contained 4 questions to identify demographic characteristics of the respondents such as gender, age, experience and educational level which were measured using a nominal scale. Section 2 contained 15 questions that focused on the scale measuring the constructs in the TAM model (PU, PEOU, ATU and BIU). These questions were adapted from Davis (1989) and related published work (Teo, 2009b; Teo and Noyes, 2011; Tarhini, Hone and Liu, 2013b) where they proved to be reliable and valid. These questions were modified to fit the specific context of the current research. More specifically, PU, PEOU and BIU were measured using 4 items, while ATU towards using RSS was measured using 3 items. A 5-point Likert scales ranging from 1-strongly disagree to 5-strongly agree was used to measure the 15 items of the TAM's constructs.

4. Results

1.4 Descriptive statistics

All the 15 items were examined for their mean, standard deviations, skewness, and kurtosis. The descriptive statistics presented below in Table 1 indicate a positive disposition towards RSS feeds. The mean values of all items were greater than the midpoint (2.5) and ranged from 3.23 (BIU3) to 4.30 (PEOU1). While the standard deviation (SD) values ranged from 0.66 to 1.10, these values indicate a narrow spread around the mean. However, to ensure adequate multivariate normality in the sample, 5 cases were removed as outliers based on having a Mahalanobis distance greater than 35 from the centroid. In addition, as the maximum-likelihood estimation method was applied during the evaluation of the structural equation model, it is important that the distribution of the data does not significantly depart from a multivariate normal distribution. This can be verified through examination of the univariate distribution index values, with skew indices greater than 3.0 and kurtosis indices greater than 10 indicative of severe non-normality (Kline, 2010). Since the skewness and kurtosis indices ranged from -0.76 to -0.16 and - 0.26 to 0.522 respectively, and thus fall well within the guidelines, therefore the data in this study were considered to be normal.

Table 1: Mean, Standard Deviation, Skewness and Kurtosis of Scale Items

	M	*SD*	*Sk*	*K*
BIU1	3.75	0.99	-.756	.522
BIU2	3.64	1.00	-.676	.197
BIU3	3.23	0.98	-.192	-.114
BIU4	3.45	1.04	-.372	-.267
PU1	3.96	0.76	-.349	.089
PU2	3.78	0.75	-.160	.009
PU3	3.43	0.88	-.276	.245
PU4	3.60	0.85	-.572	.422
ATU1	3.57	1.04	-.372	-.470
ATU2	3.79	1.04	-.693	-.021
ATU3	3.45	1.10	-.227	-.694
PEOU1	4.30	0.66	-.767	-.111
PEOU2	4.14	0.82	-.643	-.250
PEOU3	3.69	0.90	-.367	-.227
PEOU4	4.21	0.70	-.551	-.051
Mardia's K				208.7[**]

Notes: M = mean; SD = standard deviation; Sk = skewness; k = kurtosis; Mardia K = Mardia's Multivariate Kurtosis; n = sample size, [*] $p < .05$, [**] $p < .01$

1.5 Evaluation of the measurement model

Prior to analyzing the structural model, a confirmatory factor analysis (CFA) based on AMOS 20.0 was conducted to first consider the measurement model fit and then assess the reliability, convergent validity and discriminant validity of the constructs (Arbuckle, 2009). This study adopts the maximum-likelihood estimation (MLE) procedure to estimate the model's parameters where all analyses were conducted on variance-covariance matrices (Hair *et al.*, 2010; Schumacker and Lomax, 2010).

A variety of fit indices was used in the present study in order to assess the model goodness-of-fit as suggested by Hair *et al* (2010) and Kline (2010). These indices represent three different categories of model fit aspects: absolute, parsimonious, and incremental fit indices. These indices were: the minimum fit function χ^2, which is not always the best indication of model fit since it was found to be too sensitive to our sample size (Hu and Bentler, 1999), the ratio of the χ^2 static to its degree of freedom (χ^2/df), with a value of less than 5 and preferably less than 3 indicating acceptable fit (Carmines and McIver, 1981), comparative fit index (CFI), root mean square residuals (RMSR), root mean square error of approximation (RMSEA), normed fit index (NFI), adjusted goodness of fit (AGFI), goodness of fit index (GFI). From previous studies, the values of CFI, GFI and NFI should be equal to or greater than 0.90, and the values of RMSR and RMSEA should be 0.08 or less are indicative of acceptable data fit (MacCallum, Browne and Sugawara, 1996; Hu and Bentler, 1999). Like previous researchers, we made some modifications to fit the entire model to ensure good fit between the model and the data. In this regard, two indicators (PU3, PEOU3) were dropped from the initial measurement model. Table 2 shows the acceptance level fit for the final measurement model. It is clear that all the values were in the recommended range, which suggests that the measurement model has a good fit. Therefore, convergent validity, discriminant validity in addition to reliability can now be assessed in order to evaluate if the psychometric properties of the measurement model are adequate.

Table 2: Goodness-of-fit indices of the measurement and structural model

Fit Index	Measurement Model	Structural Model	Adequate Fit Criterion
χ^2	74.129	93.897	N/A
df	59	60	N/A
χ^2 / df	1.256	1.565	< 3.00
Normed Fit Index (NFI)	.962	.960	> .90
Comparative Fit Index (CFI)	.971	.969	> .90
Standardized Root Mean Square Residual (SRMR)	.064	.059	< .08
Goodness of Fit Index (GFI)	.919	.921	>.90
Root Mean Square Error of Approximation (RMSEA)	.047	.049	< .08

Notes: *df* = degrees of freedom

1.5.1 Reliability, Convergent and discriminant validities

Convergent validity refers to the degree to which two measures of constructs that theoretically should be related, are in fact observed to be related to each other (Gefen, Straub and Boudreau, 2000). In other words, it confirms whether each construct can be reflected by its own indicators in order to ensure unidimensionality of the multiple-item factors and to eliminate unreliable indicators (Bollen, 1989). According to Fornell and Larcker (1981), convergent validity of the measurement items can be evaluated using three different measures. These are composite reliability (CR) of each construct, item reliability of each measure, and the average variance extracted (AVE). The item reliability was evaluated by its factor loading onto the original construct. Cronbach's alpha is used to assess the construct reliability which indicates how rigorous observed variables are measuring the same latent variable. Whereas, average variance extracted, measures the overall amount of variance that is attributed to the construct in relation to the amount of variance attributable to measurement error (Fornell and Larcker, 1981). To establish convergent validity at the item level, the factor loading should be above 0.50. The results in Table 3 shows that the factor loading for all indicators were above the cutoff 0.5, and ranged between 5.9 and 9.9. These results suggest a satisfactory convergent validity at the items level. At the construct level, it is suggested that the AVE should be equal or exceeds 0.5 (50% of the variance of the indicators has to be accounted for by the latent variables) and CR is greater than the AVE (Hair *et al.*, 2010). To establish adequate reliability, Hair et al (2010) suggest that CR should be at least 0.6 and preferably higher than 0.7. As can be shown in Table 3, all values of the AVEs for each measure were above 0.5, and ranged between 0.512 and 0.628. In addition, the CR for all constructs was higher than 0.7 and ranged between 0.777 and 0.817, thus demonstrating an adequate reliability and convergent validity at the construct level.

Discriminant validity tests whether concepts or measurements that are supposed to be unrelated are, in fact, observed to not be related to each other (Gefen et al., 2000). According to Fornell, Tellis, and Zinkhan (1982), discriminant validity is considered adequate if the variance shared between a construct and any other construct in the model is less than the variance of the construct shared with its measures. If the square root of the AVE of a construct is greater than the off-diagonal elements in the corresponding rows and columns, this means that the given construct is more strongly correlated with its indicators than with the other constructs in the mode. As can be shown in table 3, the square root of the AVEs in all cases is greater than the off-diagonal elements in their corresponding rows and columns, thus suggesting satisfactory discriminant validity for all constructs.

Table 3: Tests for Construct reliability, convergent validity and discriminant validity

	Factor Reliability and Variance Explained				Factor Correlations[a]				
	FL	α	CR	AVE		BIU	PU	ATU	PEOU
BIU1	.783	.821							
BIU2	.829		.816	.531	BIU	(.729)			
BIU3	.649								
BIU4	.635								
PU1	.814	.792							
PU2	.865		.777	.550	PU	.286	(.742)		
PU4	.589								
ATU1	.748	.841							
ATU2	.894		.834	.628	ATU	.612	.263	(.792)	
ATU3	.724								
PEOU1	.678	.820							
PEOU2	.807		.812	.512	PEOU	.234	.247	.240	(.716)
PEOU4	.653								

Notes: FL= factor loading; α= Cronbach alpha; CR = composite reliability $(\sum \lambda)^2 / ((\sum \lambda)^2 + (\sum \delta))$; AVE = average variance explained $(\sum \lambda^2)/n$; [a] Diagonal in parentheses: square root of average variance extracted from observed variables (items); and off-diagonal: correlations between constructs.

Having achieved satisfactory reliability, convergent validity and discriminant validity at both the item and construct levels, the next step is to test the research model and examine the hypotheses by assessing the structural model.

1.6 Evaluation of the Structural Model and Hypotheses Testing

The same criteria used to measure the goodness-of-fit for the measurement model was also used for the structural model. The results in Table 2 shows acceptable fit between the model and the data [X^2 = 93.897, *df* =60, $X^2/df = 1.565$, CFI=.945, GFI= 921, NFI= .941, SRMR= .059, RMSEA= .049]. Therefore, we can proceed to test the hypothesized relationship between the constructs within the proposed research model. These hypotheses were assessed by examining path coefficients and their significance levels.
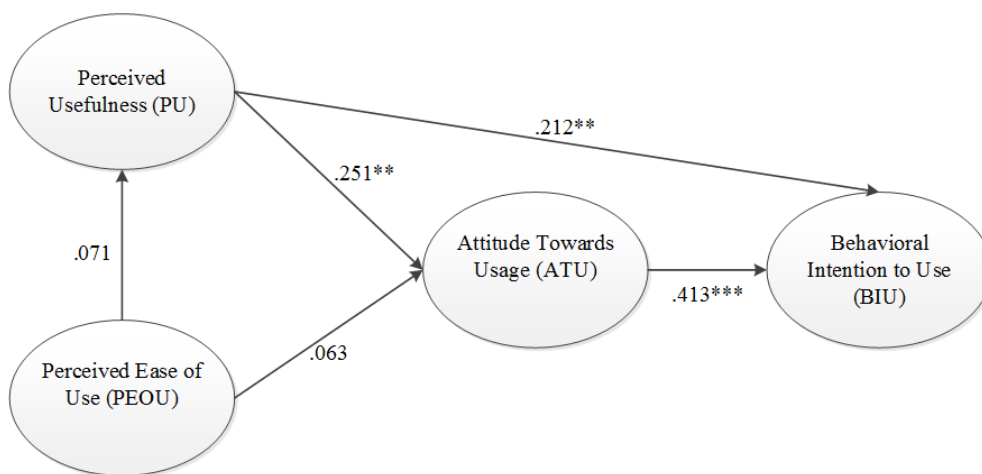
Figure 2: Results of the Hypothesized relationships

Figure 2 shows the parameter estimates for the hypothesized research model. 3 out of 5 hypotheses were supported by the data. Specifically, perceived usefulness (α=0.251, p<0.01) was found to influence computer

attitude, supporting H2. Furthermore, behavioral intention significantly influenced by perceived usefulness (α=0.212, p<0.01) and computer attitude (α=0.413, p<0.001), supporting hypotheses H4 and H5. Surprisingly, the results showed that perceived ease of use did not have a significant influence on perceived usefulness (α=0.071, n.a) or computer attitude (α=0.063, n.a). As a result, this study failed to find support for hypotheses H1 and H3. It should be noted that PEOU, PU and ATU accounted for 38.3 % of the variance of BIU, with ATU contributing the most to BIU than the other constructs. It is important to note that our proposed research model explained less variance of BIU compared to the original TAM which means that there are more constructs that should be considered.

5. Discussion

The aim of this study is to understand the factors that affect the adoption of RSS feeds on Blackboard learning environment in Lebanon using TAM. The results of the structural model partially support research hypotheses. In addition and as indicated by the squared multiple correlation of the Behavioural Intention to Use RSS feeds, the overall explanatory power of our proposed model explained 38 % of variance which is lower than that of the original TAM and previous studies in technology acceptance. These results yielded insightful practical and theoretical results that could be helpful for university policy makers and also for academics.

Contrary to our expectation and TAM, perceived ease of use was not found to be a significant predictor of perceived usefulness (*ß* = 0.62, *p*=.440) and attitude (*ß* = 0.215, *p*=.154). Therefore, H1 and H3 were not supported. Our findings are inconsistent with the results of Tarhini et al. (2014a), which showed ease of use to be a significant determinant of perceived usefulness and attitude toward using web-based learning systems. However, this finding supports the findings of other researchers (Agarwal and Prasad, 1998; Chau and Hu, 2002; Davis, Bagozzi and Warshaw, 1989) who showed that the impact of ease of use on perceived usefulness and attitude will only be critical during the early stage of adoption. This is maybe because the respondents were mostly experienced in using e-learning systems as the use of the system is mandatory, which largely reduces the effect of ease of use. Therefore, it is advised that software developers should develop user-friendly interfaces since they will influence the students' perceptions to use e-learning services as opined by a recent study conducted by Tarhini et al (2014b) especially during the early stage of adoption.

The results of the coefficient path also showed that perceived usefulness had a direct positive effect on both ATU (*ß*= 0.499, *p=.002*) and BIU (*ß* = 0.293, *p*=.018) towards using RSS feeds on Blackboard environment which support hypotheses H2 and H4. Our results are consistent with previous findings of Taylor and Todd (1995) which showed that PU has both behavioural intention towards using technology is directly impacted by perceived usefulness and indirectly via attitude. Our results also support the findings of Davis *et al*. (1989), Tarhini et al (2013b), which showed that perceived usefulness has a direct significant impact on behavioural intention towards using the technology. Students using the system may benefit from the services and consequently encouraged to use the system. If the students find it useful in their education, in terms of convenient access and prompt services, when compared to the old and traditional means (only face-to-face lectures), then possibly this practice might spread the use of e-learning services throughout the Lebanese society as students will be more willing to use the system. Therefore, it is expected that policy makers should emphasize on the usefulness of the system by improving the quality of their e-learning system rather than ease its ease of use. This will help the students to benefit from the RSS feeds such as the possibility to create and use repositories of learning objects on the public Internet or on a private intranet, live update about learning activities such as new updated material, or new discussion topic.

The results of the structural model also showed that attitude had a direct effect on INT (*ß* = 0.396, *p*=.001) which indicates that H5 was supported. Compared to other predictors of behavioural intention, attitude was found to be the strongest determinate. This finding is consistent with previous research (Davis *et al.*, 1989; Teo, 2010a). It is therefore advised that policy makers should develop and manage users' attitude in order to ensure successful implementation of web-based learning services such as RSS feeds.

6. Conclusion, Limitations and Future Research

The main aim of this study was to examine the factors that may affect the acceptance and adoption of RSS feeds on Blackboard system among Lebanese students using TAM. By doing so, we extend the applicability and

generalizability of TAM in a different context. The results of the structural model revealed that PU and ATU to be significant factors in impacting students' behavioural intention towards using RSS feeds on Blackboard, and accounted for 38 % of the variance of behavioural intention which is lower than that of TAM. Unexpectedly, PEOU was not found to be a significant predictor of PU and ATU. Consequently, it may be necessary to extend the scale by capturing additional moderators and predictors, such as cultural values and subjective norms.

As with other cross-sectional studies, it is important to bear in mind some of the weaknesses for the current study before interpreting its findings. First, this research employed a non-random convenience sampling technique. Therefore, the user sample is a major drawback of the current study. Since some might argue that different student groups have different perceptions towards using e-learning systems because of their variant backgrounds. Thus, care should be taken when generalizing the findings of the study. Future research may use random sampling technique which considered a representative of the whole population.

Second, this study studied only one type of user (Lebanese university students) and only one web-based learning system (Blackboard). Future research may include different technologies (e.g. mobile learning), different users (younger age students, disabled students), or different countries especially those with developed countries, such as England or USA in order to extend the applicability of the findings of this study to other contexts. It is easy to argue that a theory applicable to developing countries may not be applicable in developed countries (Teo *et al.*, 2008; Srite and Karahanna, 2006; Venkatesh and Zhang, 2010; Tarhini, Hone and Liu, 2013c; Tarhini, Hone and Liu, 2014c).

Finally, the data for our research model were collected at a single specific time. Since user behaviour is dynamic and constantly changing, we only took a snapshot of this model. Therefore, future research may employ longitudinal study in order to investigate the results at different time periods and also to make comparison. In addition, future research should extend TAM with inclusion of diverse theoretical models and diverse antecedent. This will provide more insight into the phenomenon of adoption and usage of technology.

References

Abbasi, M. S., Chandio, F. H., Soomro, A. F., & Shah, F. (2011). Social influence, voluntariness, experience and the internet acceptance: An extension of technology acceptance model within a south-Asian country context. Journal of Enterprise Information Management, 24(1), 30-52.

Agarwal, R. and Prasad, J. (1998). A conceptual and operational definition of personal innovativeness in the domain of information technology. *Information systems research* 9, 204-215.

Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes* 50, 179-211.

Ajzen, I. and Fishbein, M. (1980) *Understanding attitudes and predicting social behavior* (278). Prentice-Hall.

Arbuckle, J. (2009) *Amos 18 User's Guide*. SPSS Incorporated.

Arenas-Gaitán, J., Ramírez-Correa, P. E. and Javier Rondán-Cataluña, F. (2011). Cross cultural analysis of the use and perceptions of web Based learning systems. *Computers & Education* 57, 1762-1774.

Asmus, J., Bonner, C., Esterhay, D., Lechner, A. and Rentfrow, C. (2005). Instructional design technology trend analysis. *Retrieved April* 20, 2009.

Bagozzi, R. P. (2007). The Legacy of the Technology Acceptance Model and a Proposal for a Paradigm Shift. *Journal of the Association for Information Systems* 8, 3.

Baroud, F. and Abouchedid, k. (2010) eLEARNING IN LEBANON: Patterns of E-learning Development in Lebanon's Mosaic Educational Context. *In Demiray, U. (Editor) e-learning practices: cases on challenges facing e-learning and national development, institutional studies and practices* (pp. 409-424). Eskisehir-Turkey, Anadolu University.

Bollen, K. A. (1989) *Structural equations with latent variables*. MA: Wiley.

Carmines, E. G. and McIver, J. P. (1981). Analyzing models with unobserved variables: Analysis of covariance structures. *Social measurement: Current issues*, 65-115.

Chang, S. C. and Tung, F. C. (2008). An empirical investigation of students' behavioural intentions to use the online learning course websites. *British Journal of Educational Technology* 39, 71-83.

Chau, P. Y. K. and Hu, P. J. (2002). Examining a model of information technology acceptance by individual professionals: An exploratory study. *Journal of management information systems* 18, 191-230.

Cold, S. J. (2006). Using Really Simple Syndication (RSS) to enhance student research. *ACM SIGITE Newsletter* 3, 6-9.

D'Souza, Q. (2006) *RSS ideas for educators* [WWW document]|. http://www.teachinghacks.com/wp-content/uploads/2006/01/RSS%20Ideas%20for%20Educators111.pdf URL|

Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS quarterly*, 319-340.

Davis, F. D., Bagozzi, R. P. and Warshaw, P. R. (1989). User acceptance of computer technology: a comparison of two theoretical models. *Management Science*, 982-1003.

Duffy, P. D. and Bruns, A. (2006). The use of blogs, wikis and RSS in education: A conversation of possibilities.

Fernandez, V., Simo, P. and Sallan, J. M. (2009). Podcasting: A new technological tool to facilitate good practice in higher education. *Computers & Education* 53, 385-392.

Fornell, C. and Larcker, D. F. (1981). Structural equation models with unobservable variables and measurement error: Algebra and statistics. *Journal of marketing research*, 382-388.

Fornell, C., Tellis, G. J. and Zinkhan, G. M. (1982). Validity assessment: A structural equations approach using partial least squares. *AMA Chicago*, 405-409.

Gefen, D. and Straub, D. W. (1997). Gender differences in the perception and use of e-mail: An extension to the technology acceptance model. *MIS quarterly*, 389-400.

Gefen, D., Straub, D. W. and Boudreau, M. C. (2000). Structural equation modeling and regression: Guidelines for research practice.

Hair, J. F. J., Black, W. C., Babin, B. J., Anderson, R. E. and Tatham, R. L. (2010) *Multivariate data analysis*. New Jersey: Prentice-Hall.

Hrastinski, S. (2008). Asynchronous and synchronous e-learning. *Educause quarterly* 31, 51-55.

Hu, L. and Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling: A Multidisciplinary Journal* 6, 1-55.

Kanthawongs, P. and Kanthawongs, P. (2013). Individual and Social Factors Affecting Student's Usage Intention in Using Learning Management System. *Procedia-Social and Behavioral Sciences* 88, 89-95.

Kiraz, E. and Ozdemir, D. (2006). The relationship between educational ideologies and technology acceptance in pre-service teachers. *Journal Of Educational Technology And Society* 9, 152.

Kline, R. B. (2010) *Principles and practice of structural equation modeling*. The Guilford Press.

Kung-Teck, W., Osman, R. and Rahmat, M. K. (2013). Understanding Student Teachers' Behavioural Intention to Use Technology: Technology Acceptance Model (TAM) Validation and Testing. *International Journal of Instruction* 6.

Lan, Y.-F. and Sie, Y.-S. (2010). Using RSS to support mobile learning based on media richness theory. *Computers & Education* 55, 723-732.

Liu, I. F., Chen, M. C., Sun, Y. S., Wible, D. and Kuo, C. H. (2010). Extending the TAM model to explore the factors that affect Intention to Use an Online Learning Community. *Computers & Education* 54, 600-610.

Liu, S.-H., Liao, H.-L. and Pratt, J. A. (2009). Impact of media richness and flow on e-learning technology acceptance. *Computers & Education* 52, 599-607.

MacCallum, R. C., Browne, M. W. and Sugawara, H. M. (1996). Power analysis and determination of sample size for covariance structure modeling. *Psychological methods* 1, 130.

Markett, C., Sánchez, I. A., Weber, S. and Tangney, B. (2006). Using short message service to encourage interactivity in the classroom. *Computers & Education* 46, 280-293.

McCoy, S., Everard, A. and Jones, B. (2005). An examination of the technology acceptance model in Uruguay and the U.S.: a focus on culture. *Journal of Global Information Technology* 8, 27-45.

McCoy, S., Galletta, D. F. and King, W. R. (2007). Applying TAM across cultures: the need for caution. *European Journal of Information Systems* 16, 81-90.

Meurant, R. C. (2007) A Preliminary Survey of the Use of Cell Phones, Electronic Dictionaries, SMS, Email, Computers and the Internet by Korean College EFL Students with Respect to Patterns of L1: L2 Language Use and the Associated Language Learning Strategies Used in Acce. *Multimedia and Ubiquitous Engineering, 2007. MUE'07. International Conference on.* (pp. 767-772). IEEE.

Nasser, R., Abouchedid, K. (2000). Attitudes and concerns towards distance education: the case of Lebanon. *Online Journal of Distance Learning Administration* 3, 1-10.

Nasser, R. N., Khoury, B. and Abouchedid, K. (2008). University students' knowledge of services and programs in relation to satisfaction: a case study of a private university in Lebanon. *Quality Assurance in Education* 16, 80-97.

Ngai, E. W. T., Poon, J. K. L. and Chan, Y. H. C. (2007). Empirical examination of the adoption of WebCT using TAM. *Computers & Education* 48, 250-267.

Park, S. Y. (2009). An analysis of the technology acceptance model in understanding university students' behavioral intention to use e-learning. *Educational Technology & Society* 12, 150-162.

Pituch, K. A. and Lee, Y.-k. (2006). The influence of system characteristics on e-learning use. *Computers & Education* 47, 222-244.

Prabowo, R., Thelwall, M. and Alexandrov, M. (2007). Generating overview timelines for major events in an RSS corpus. *Journal of Informetrics* 1, 131-144.

Richardson, W. (2005) *RSS Quick start guide for educators* [WWW document]|. http://weblogg-ed.com/wp-content/uploads/2006/05/RSSFAQ4.pdf URL|

Rodriguez, T. and Lozano, P. (2011). The acceptance of Moodle technology by business administration students. *Computers & Education*.

Rogers, E. M. (1995) *Diffusion of innovations*. New York: Simon and Schuster.

Rose, G. and Straub, D. (1998). Predicting general IT use: Applying TAM to the Arabic world. *Journal of Global Information Management (JGIM)* 6, 39-46.

Schumacker, R. E. and Lomax, R. G. (2010) *A beginner's guide to structural equation modeling*. York: Routledge: Lawrence Erlbaum.

Shim, J. and Guo, C. (2009). Weblog Technology for Instruction, Learning, and Information Delivery*. *Decision Sciences Journal of Innovative Education* 7, 171-193.

Srite, M. and Karahanna, E. (2006). The role of espoused national cultural values in technology acceptance. *MIS quarterly* 30, 679-704.

Straub, D., Keil, M. and Brenner, W. (1997). Testing the technology acceptance model across cultures: A three country study. *Information & Management* 33, 1-11.

Sun, P.-C. and Cheng, H. K. (2007). The design of instructional multimedia in e-Learning: A Media Richness Theory-based approach. *Computers & Education* 49, 662-676.

Tarhini, A., Scott, M., Sharma, K.S., & Abbasi, M.S. (2015a). Differences in Students' Intention to Use RSS Feeds Between Lebanese and British students: A Multi-Group Invariance Analysis Based on the Technology Acceptance Model. *Electronic Journal of e-Learning, 13(1), 14-29*

Tarhini, A., Teo, T, & Tarhini, T. (2015b)*. A cross-cultural validity of the E-learning Acceptance Measure (ElAM) in Lebanon and England: A Confirmatory Factor Analysis, Education and Information Technologies, DOI: 10.1007/s10639-015-9381-9*

Tarhini, A., Hone, K. and Liu, X. (2014a). A cross-cultural examination of the impact of social, organisational and individual factors on educational technology acceptance between British and Lebanese university students. *British Journal of Educational Technology*.

Tarhini, A., Hone, K. and Liu, X. (2014b). The effects of individual differences on e-learning users' behaviour in developing countries: A structural equation model. *Computers in Human Behavior* 41, 153-163.

Tarhini, A., Hone, K. and Liu, X. (2014c). Measuring the moderating effect of gender and age on e-learning acceptance in England: A structural Equation Modelling Approach of an extended Technology Acceptance Model. *Journal of Educational Computing Research* 51(2), 163-184.

Tarhini, A., Hone, K. and Liu, X. (2013a) Extending the TAM model to empirically investigate the students' behavioural intention to use e-learning in developing countries. *Science and Information Conference (SAI), 2013.* (pp. 732-737). IEEE.

Tarhini, A., Hone, K. and Liu, X. (2013b). Factors Affecting Students' Acceptance of e-Learning Environments in Developing Countries: A Structural Equation Modeling Approach. *International Journal of Information and Education Technology* 3, 54-59.

Tarhini, A., Hone, K. and Liu, X. (2013c). User Acceptance Towards Web-based Learning Systems: Investigating the Role of Social, Organizational and Individual Factors in European Higher Education. *Procedia Computer Science* 17, 189-197.

Teo, T. (2009a). The Impact of Subjective Norm and Facilitating Conditions on Pre-Service Teachers' Attitude toward Computer Use: A Structural Equation Modeling of an Extended Technology Acceptance Model. *Journal of Educational Computing Research* 40, 89-109.

Teo, T. (2009b). Modelling technology acceptance in education: A study of pre-service teachers. *Computers & Education* 52, 302-312.

Teo, T. (2010a). Examining the influence of subjective norm and facilitating conditions on the intention to use technology among pre-service teachers: a structural equation modeling of an extended technology acceptance model. *Asia Pacific Education Review* 11, 253-262.

Teo, T. (2010b). A structural equation modelling of factors influencing student teachers' satisfaction with e-learning. *British Journal of Educational Technology* 41, E150-E152.

Teo, T. and Lee, C. B. (2008). Attitudes towards computers among students in higher education: A case study in Singapore. *British Journal of Educational Technology* 39, 160.

Teo, T., Luan, W. S. and Sing, C. C. (2008). A cross-cultural examination of the intention to use technology between Singaporean and Malaysian pre-service teachers: an application of the Technology Acceptance Model (TAM). *Journal of Educational Technology and Society* 11, 265-280.

Teo, T. and Noyes, J. (2011). An assessment of the influence of perceived enjoyment and attitude on the intention to use technology among pre-service teachers: A structural equation modeling approach. *Computers & Education* 57, 1645-1653.

Venkatesh, V. and Bala, H. (2008). Technology acceptance model 3 and a research agenda on interventions. *Decision Sciences* 39, 273-315.

Venkatesh, V., Morris, M. G., Davis, G. B. and Davis, F. D. (2003). User acceptance of information technology: Toward a unified view. *MIS quarterly*, 425-478.

Venkatesh, V. and Zhang, X. (2010). Unified theory of acceptance and use of technology: US vs. China. *Journal of global information technology management* 13, 5-27.

West, R. E., Wright, G., Gabbitas, B. and Graham, C. R. (2006). Reflections from the introduction of blogs and RSS feeds into a preservice instructional technology course. *TechTrends* 50, 54-60.

Yousafzai, S. Y., Foxall, G. R. and Pallister, J. G. (2007). Technology acceptance: a meta-analysis of the TAM: Part 2. *Journal of Modelling in Management* 2, 281-304.