Testing the technology acceptance model with Romanian university students

Alexandru Balog, Costin Pribeanu
ICI Bucharest, Romania
Bd. Mareşal Averescu No.8-10, Bucureşti
{alexb,pribeanu}@ici.ro

ABSTRACT

Social networking websites, in general, and Facebook, in particular, gained a lot of popularity among university students. The increasing rate of the Facebook adoption stimulates the researchers to analyze and explain its usage. A well known model able to do this is the technology acceptance model (TAM) that has been tested on a large diversity of computer systems. This paper presents a case study in testing TAM to explain the adoption of Facebook by Romanian university students. The model estimation results show that the perceived ease of use and the perceived enjoyment have a stronger influence on the intention to use Facebook than the perceived usefulness. This study found that the most important determinant is the perceived enjoyment.

Key words

Social networking sites, technology acceptance, perceived ease of use, perceived enjoyment, perceived usefulness.

ACM Classification

D.2.2: Design tools and techniques. H5.2 User interfaces.

INTRODUCTION

Social networking websites are interactive environments for communication, socialization, collaboration, exchange of information / resources, and self-advertising. Facebook is a social networking site that gained a lot of popularity in recent years and is widely used by university students [12, 15, 17, 18, 20].

Several studies showed that for many users Facebook became part of their everyday life, being both useful [3, 12, 15, 20] and enjoyable [14, 17]. The widespread usage of social networking websites stimulated the research aiming to explain their adoption [12, 14, 17]. However, few approaches exist that analyze the main determinants of the Facebook adoption by university students.

A well-known model aiming to explain and predict the technology acceptance on a large variety of technologies is TAM (Technology Acceptance Model), developed by Davis [7], and Davis et al. [8]. TAM focuses on two main drivers, the perceived ease of use (PEU) and the perceived usefulness (PU), that determine the intention to use a technology. In further studies, the perceived enjoyment (PE) has been added as an intrinsic motivation to use a technology [9, 13].

In this paper, a case study of testing TAM is presented to explain the adoption of Facebook by Romanian university students. The model considers three factors: the perceived ease of use, perceived usefulness, and the perceived enjoyment. The sample consists of 414 Romanian university students from a university of economics.

The rest of this paper is organized as follows. In the next section we present the theoretical background and model conceptualization. Then, the empirical validation of the model and the estimation results are discussed. The paper ends with conclusions and future work.

THORETICAL BACKGROUND AND HYPOTHESES

Usage of Facebook in educational contexts

The explosion of social networking websites is closely related to the social learning featuring meeting, active participation, critical thinking, information and content sharing. The proliferation of Facebook in university contexts creates many opportunities for learning. Students benefit from sharing information and resources in their social network as well as from the debate on various issues of interest [15, 18, 20].

Lampe et al. [15] investigated the usefulness of Facebook as an information source. Their study shows how FB users convert the social capital in information (another form of capital). Lee et al. [16] explored the perceived community value of Facebook and found that the experiential value was the most important outcome of information sharing in a social network.

In a recent study, the Facebook usefulness for students has been modeled as a multidimensional construct featuring three dimensions: social, information, and collaboration usefulness [3]. The multidimensional model have been then used to analyze the differences between two university profiles [19].

Park et al. [18] identified four primary needs for joining Facebook groups: socialization, entertainment, self-status seeking, and information. The study of Hart et al. [12] as regards the usage patterns, shows that several Facebook functions were rated for positive experiences. Most often selected experiences are the enjoyment and the curiosity.

Related work in the technology acceptance

The first technology acceptance model considered two main drivers of the behavioral intention to use a computer system: the perceived ease of use and the perceived usefulness [7]. Later on, TAM has been extended with the perceived enjoyment (PE).

Heijden [13] distinguished between two kinds of computer system: production-oriented (or utilitarian) and pleasure-

oriented (or hedonic). His study concluded that in the case of hedonic systems, perceived ease of use and perceived enjoyment (intrinsic motivation) are stronger predictors of the intention to use than perceived usefulness (extrinsic motivation) [13].

Perceived enjoyment is an important determinant of the intention to use since users who experience pleasure or enjoyment are more likely to form a positive attitude and intention to use it than others [9].

The e-learning systems that are using novel technologies, such as Augmented Reality, aim to increase the students' motivation to learn. Testing TAM with these e-learning systems showed that the perceived enjoyment is a stronger predictor than the perceived usefulness [9]. Similar results have been reported in the study of Lee et al. [16] that tested TAM with an Internet-based learning medium.

In their study, Lin & Lu [17] integrated a motivational model to analyze why people use the social networking websites. They found that the perceived enjoyment is the main driver of the continuation intention. More recently, Iordache et al. (14) tested the motivational model with 152 Lithuanian university students and found that perceived enjoyment is a stronger predictor of the continuation intention of using Facebook than perceived usefulness.

Research model and hypotheses

This study proposes aims to empirically validate the acceptance model in the Facebook context based on the theoretical framework of TAM and the literature review.

In TAM, the extrinsic motivation is conceptualized as perceived usefulness, defined as "the degree to which a person believes that using a particular system would enhance his or her job performance" [7].

Intrinsic motivation is conceptualized as perceived enjoyment, defined as "the extent to which the activity of using a specific system is perceived to be enjoyable in its own rights, aside from any performance consequences resulting from system use" [9].

Perceived ease of use was defined as "the degree to which a person believes that using a particular system would be free of effort" [7].

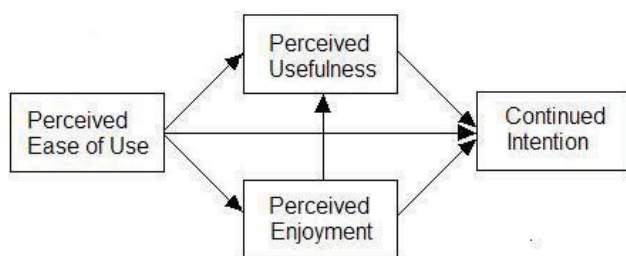The research model in Figure 1 illustrates the hypotheses.

Figure 1. The research model.

Previous research showed that the perceived ease of use (PEU) is supposed to positively influence the perceived usefulness (PU) [8], the perceived enjoyment [13], and the intention to continue using (CI) [21].

In an e-learning context, the perceived enjoyment (PE) is supposed to positively influence the perceived usefulness [3, 14, 21, 22]. Previous research shows that PE has both a direct and indirect influence on the intention to continue using the system [8, 13, 14].

There is extensive empirical evidence in the literature that the perceived usefulness has a direct positive influence on the intention to use [7, 8, 21].

METHOD

Data collection and sample

The model has been tested on 414 university students, from which 156 men and 258 women. The age of participants is varying between 18 and 37 years with a mean of 21.28 years (SD=2.78). Most of the participants (313) are undergraduates.

Item	Description	M	SD
PEU1	It is easy to learn how to use Facebook	6.10	1,27
PEU2	Facebook is easy to use	6.21	1.17
PEU3	My interaction with Facebook is clear and understandable	5,69	1,38
PU1	Using Facebook improves participation in collective activities	4.71	1.52
PU2	Using Facebook I can better present my university work to other people	3.81	1.60
PU3	Using Facebook I am better informed about events of interest in my university	5.05	1.52
PU4	Using Facebook I get useful information from university people	5.15	1.47
PU5	On Facebook I can find useful resources for my university work	4.96	1.59
PU6	Using Facebook improves communication between colleagues	4.99	1.55
PU7	Using Facebook encourages the creation of academic groups based on similar interests and needs	4.99	1.63
PU8	Using Facebook improves the student group work	4,92	1,49
PE1	I have fun using Facebook	4,56	1,73
PE2	Using Facebook is enjoyable	4.91	1.53
PE3	Using Facebook is entertaining	4.00	1.72
PE4	Using Facebook is pleasant	4.72	1.63
CI1	I intend to continue using Facebook in the future	5.34	1.59
CI2	It is likely that I will continue using Facebook in the future.	5.54	1.51
CI3	I will regularly use Facebook in the future.	5.08	1.73

Table 1. Variables.

Students were asked to answer general questions (faculty, enrollment, age, and gender), questions regarding the use of Facebook (network size, frequency, and duration of use), and then to evaluate several items on 7-points Likert scale. The variables are presented in Table 1.

The constructs PEU, PE, and CI have been measured by using and / or adapting existing scales in the literature [8, 9, 14]. For PU a multidimensional scale developed and validated in [3] has been used. The scale is featuring three dimensions: social usefulness, information usefulness, and collaboration usefulness.

Analytical procedures
Data analysis has been carried out using the statistical package SPSS 16.0 for Windows. Structural Equation Modelling (SEM) with AMOS 7.0 software was used to test the model. Testing was carried out in accordance with a two-step approach [1] including the validation of the measurement and structural models.

Based on the recommendations from the literature [10, 11], the following goodness-of-fit measures were used: normed chi-square (χ^2/df), Tucker-Lewis index (TLI), comparative fit index (CFI), standardized root mean square residual (SRMR), and root mean square error of approximation (RMSEA).

The fit between the model and the data is supported if the following conditions hold: the normed chi-square is less than 3, TLI and CFI exceed 0.95, SRMSR is less than 0.05, and RMSEA is less than 0.08.

The three dimensions of the perceived usefulness have already been validated in two previous studies, as first-order factors, for unidimensionality and reliability [3, 19]. According to Bagozzi & Edwards [2], in this case the items could be averaged and the resulting constructs could further be used as items of a first-order construct [2] in other models. The descriptives are presented in Table 2.

Item	Description	M	SD
mUS	Social usefulness	4.26	1,38
mUI	Information usefulness	5.05	1.33
mUC	Collaboration usefulness	4.97	1,37

Table 2. Descriptives for the dimensions of PU.

ANALYSIS AND RESULTS

Descriptive statistics
The standard deviations ranged from 1.27 to 1.73, indicating a fairly narrow spread of scores around the mean. Univariate and multivariate outliers were searched in the data set and since none of the cases appeared to be extreme, all the data were kept for analysis.

Data normality was investigated in terms of skewness and kurtosis. The values are within the recommended level [11], supporting the moderate departure from normality for all variables.

All variables in the model have mean value over 4.00 (neutral value). The items related to the perceived ease of

use were highly rated by the students, which suggests that that Facebook is very easy to use.

Measurement model
We examined the convergent and discriminant validity of the model using the procedure outlined by Fornell and Larcker [10]. The results of model testing are presented in Table 3.

	Alpha	**CR**	**AVE**	**PEU**	**PE**	**PU**	**CI**
PEU	0.855	0.885	0.722	0.849			
PE	0.935	0.914	0.728	0.376	0.853		
PU	0.935	0.784	0.550	0.402	0.533	0.742	
CI	0.917	0.920	0.793	0.404	0.619	0.478	0.891

Notes: The bold diagonal numbers are the square root of AVE

Table 3. Results of discriminant validity.

All standardized item loadings were statistically significant (*t*-values > 1.96). The item reliability (R^2) values are above the suggested standard of 0.50 [11], with exception of PU2 (0.40). Cronbach's alpha values are acceptable for all three constructs.

The composite reliability (CR) values ranged from 0.827 to 0.920, above the minimum level of 0.70 [11], indicating an adequate reliability. The values of the average variance extracted (AVE) are all above the minimum level of 0.50 [11], ranging from 0.715 to 0.794, confirming the convergent validity.

The discriminant validity of the constructs was examined through the squared correlation test [10]. The results in Table 2 show that the square root of the AVE is greater than the correlations between constructs, thus providing evidence of an adequate discriminant validity.

Structural model
A structural equation modeling (SEM) was carried on to test the fit between the research model and the data. The model testing results presented in Figure 2 show the item loadings, the standardized path coefficients, and the explained variance (R^2) for each variable.
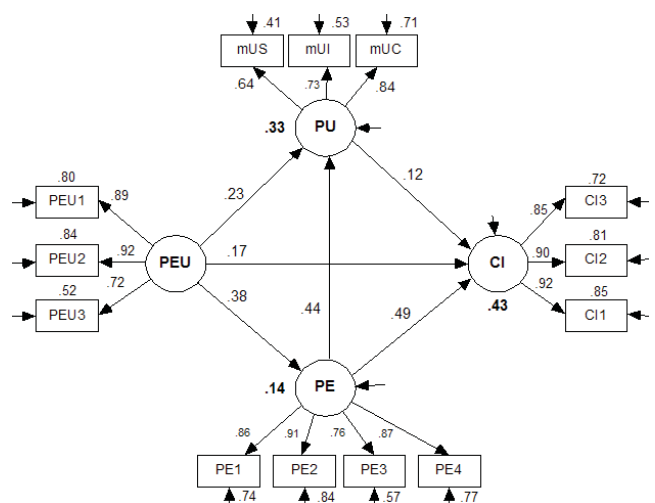

Figure 2. The structural model estimation results.

The measurement model fits acceptably with the data. Although the χ^2 test is significant ($\chi^2 = 191.46$, df = 59, p = 0.000), the other fit indices are very good: χ^2/df = 3.245, CFI = 0.964, TLI = 0.952, SRMR = 0.052, RMSEA = 0.074 and its 90% confidence interval is fairly narrow (i.e., 0.062-0.086).

The analytical results show that all hypotheses are supported. The perceived usefulness has the smallest influence on the continuation intention ($\beta = 0.12$, p < 0.047). The rest of path coefficients are significant at p <0.001 level.

The model explains 33% of the variance in the perceived usefulness, 14% in the perceived enjoyment, and 43% in the continued intention to use Facebook.

DISCUSSION AND CONCLUSION

The main contribution of this study is an empirical validation of the technology acceptance model, measuring the contribution of each factor to the continued intention to use of Facebook by university students.

All hypotheses in this study have been confirmed, thus showing that the intention to continue using Facebook is influenced by three main factors: ease of use, usefulness, and enjoyment. The perceived ease of use has both a direct effect and an indirect effect, mediated by the perceived enjoyment and perceived usefulness.

This study found that for the Romanian university students the perceived enjoyment is the strongest determinant of the Facebook adoption. The perceived ease of use and the perceived enjoyment are stronger determinants of the intention to continue using Facebook than the perceived usefulness, which confirms the findings of Heijden [13].

The results are also confirming the findings from a previous study that tested the motivational model on a sample of university students from Lithuania [14]. Overall, the findings of this study confirm the hedonic nature of the Facebook.

Future work will focus on extending the model, in order to analyze the external variables that are influencing the Facebook adoption. Then the evaluation instrument will be administrated in several universities in order to cross-validate the model on several samples.

ACKNOWLEDGMENTS

REFERENCES

1. Anderson, J.C. and Gerbing, D.W. Structural Equation Modelling in Practice: A Review and Recommended Two-Step Approach. *Psychological Bulletin 103 (3)*, (1988), 411-423.

2. Bagozzi, R. and Edwards, J. A general approach for representing constructs in organizational research. *Organizational Research Methods* 1(1), (1998), 45-87.

3. Balog, A. and Pribeanu, C. A multidimensional model of the Facebook usefulness for students. *Revista Româna de Interactiune Om-Calculator* 8(2), (2015), 157-172.

4. Balog A. and Pribeanu C. An extended acceptance model for Augmented Reality educational applications. Chapter 22 in *Handbook of Research on 3-D Virtual Environments and Hypermedia for Ubiquitous Learning*, Neto, F. M., de Souza, R., & Gomes, A. S. (Eds), Hershey, PA: IGI Global. (in press), 2016.

5. Cheng, M. Antecedents and consequences of e-learning acceptance. *Information System Journal* 21 (3), (2005), 269-299.

6. Chiu, C. M., Hsu, M. H., Sun, S. Y., Lin, T. C. and Sun, P. C. Usability, quality, value, and e-learning continuance decisions. *Computers & Education*, 45(4), (2005), 399-416.

7. Davis, F.D. Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly,* 13 (3), (1989), 319-340.

8. Davis, F.D., Bagozzi, R.P. and Warshaw, P.R. User acceptance of computer technology: A comparison of two theoretical models, *Management Science,* 35 (8), (1989), 982-1003.

9. Davis, F.D., Bagozzi, R.P. and Warshaw, P.R. Extrinsic and intrinsic motivation to use computers in the workplace. *Journal of Applied Social Psychology,* 22 (14), (1992), 1111-1132.

10. Fornell, C. and Larcker, D. F. Evaluating structural equations models with unobservable variables and measurement error. *Journal of Marketing Research,* 18 (1), (1981), 39-50.

11. Hair, J. F., Black, W. C., Babin, B. J. and Anderson, R. *Multivariate Data Analysis*. 6th Ed., Prentice Hall, 2006.

12. Hart, J., Ridley, C., Taher, F., Sas, C. and Dix, A. Exploring the Facebook experience: a new approach to usability. *Proceedings of the 5th Nordic conference on Human-computer interaction –NordiCHI 2008,* ACM, (2008), 471-474.

13. Heijden, H. van der. User acceptance of hedonic information systems. *MIS Quarterly* 28 (4), (2004), 695-704.

14. Iordache, D.D., Balog, A., Pribeanu, C. and Lamanauskas, V. A motivational model for the acceptance of Facebook by university students (2015). Dardala, M., Rebedea T.E. (Eds.) *Proceedings of RoCHI 2015 Conference*, Bucharest, 24-25 September, (2015), 21-24.

15. Lampe, C., Vitak, J., Gray, R. and Ellison, N.B. Perceptions of Facebook's value as information source. *Proceedings of CHI 2012*, (2012), 3195-3204.

16. Lee, M.K.O., Cheung, C.M.K. and Chen, Z. Acceptance of Internet-based learning medium: the role of extrinsic and intrinsic motivation. *Information and Management,* 42 (3), (2005), 1095-1104.

17. Lin, K. Y. and Lu, H. P. Why people use social networking sites: An empirical study integrating network externalities and motivation theory.

Computers in Human Behavior, 27(3), (2011), 1152-1161.

18. Park, N., Kee, K. F. and Valenzuela, S. Being immersed in social networking environment: Facebook groups, uses and gratifications, and social outcomes. *CyberPsychology & Behavior*, 12(6), (2009), 729-733.

19. Pribeanu, C. and Lamanauskas, V. Usefulness of Facebook for students: analysis of university profile differences from a multidimensional perspective. *Proceedings of eLSE 2016 Vol. II*, Bucharest, 21-22 April, (2016), 557-564.

20. Selwyn, N. Faceworking: exploring students' education-related use of Facebook. Learning, Media and Technology, 34(2), (2009), 157-174.

21. Venkatesh, V. and Davis, F.D. A theoretical extension of the technology acceptance model: four longitudinal field studies. *Management Science* 45 (2), (2000), 186-204.

22. Yi, M.Y. and Hwang, Y. Predicting the use of web-based information systems: self-efficacy, enjoyment, learning goal orientation, and the technology acceptance model. *International Journal of Human Computer Studies* 59(4), (2003), 431-449.