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RETRACTED ARTICLE: E-learning adoption of academicians: a proposal for an extended model

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ABSTRACT

From the beginning of the e-learning technology era, many concerns arose regarding the use of e-learning in everyday academic processes. Thus, in recent years, a number of studies were conducted on e-learning acceptance, mostly with the use of Unified Theory of Acceptance and Use of Technology (UTAUT) Model. Current study investigates the determinants of acceptance of academic e-learning technologies with the use of proposed modified UTAUT model. The basic UTAUT model was supplemented by the examined new determinants: system interactivity and the area of scientific expertise. Therefore, the paper contributes to UTAUT theory, applied in e-learning, by utilising empirical research with a modified UTAUT model including these two new variables. This study confirmed the hypotheses related to the effects of performance expectancy, effort expectancy, and system interactivity on behavioural intention to use e-learning technologies, and also stated that the area of scientific expertise does not have a direct impact on the intention to use e-learning technologies. The research model has been tested in an academic environment in Turkey.

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E-learning; higher education; UTAUT; technology acceptance; survey

1. Introduction

Many researchers have proposed theories and models of technology acceptance in order to explain and predict users' acceptance of the specific hardware or software. User experience and measuring user satisfaction of various new technological gadgets and equipment have gained importance, given the recent shutdown of Google Glass project (Shin 2017a). This crucial challenge inspired many researchers to propose the models of their acceptance and adoption of potential users. Many IS scholars starting from Fishbein and Ajzen (1975) and Davis (1989) have proposed and verified their theories, solutions, models, and methods of the acceptance, adoption, and use of hardware and software. In particular, the following theoretical frameworks should be mentioned, among others: TAM – Technology Acceptance Model (Davis, Bagozzi, and Warshaw 1989), TPB – Theory of Planned Behaviour (Ajzen 1991), IDT – Innovation Diffusion Theory (Moore and Benbasat 1991), MM – Motivational Model (Davis, Bagozzi, and Warshaw 1992), C-TAM-TPB – Combined Model of TAM and TPB (Taylor and Todd 1995), SCT – Social Cognitive Theory (Compeau and Higgins 1995), TAM 2 (Venkatesh and Davis 2000), UTAUT – Unified Theory of Acceptance and Use of Technology (Venkatesh et al. 2003), and recently, TAM 3 (Venkatesh and Bala 2008). The extensive comparative analysis of models

and theories to technology and software acceptance is carried out in a number of publications including Venkatesh et al. (2003); Roca and Gagné (2008); Islam (2011); Oye, Iahad, and Ab. Rahim (2012); and Shin (2017b).

Among the TAMs, UTAUT attracts particular attention in the technology acceptance research field. The UTAUT model (Venkatesh et al. 2003) enables us to assess dependent variables (DVs), i.e. – behavioural intention (BI), and finally, the use behaviour (UB) by estimating the influence of four core independent variables (IVs) as performance expectancy (PE), effort expectancy (EE), social influence (SI), and facilitating conditions (FC). Besides, UTAUT considers the influence of four moderators (M): age, gender, prior experience with technologies, and voluntariness of use.

The classical form of UTAUT model was modified by a number of researchers through reshaping the classical model by supplementing additional independent variables and determinants and/or resigning the certain classical determinants and moderators. The exemplary modifications regard new variables or determinants like system flexibility (Cody-Allen and Kishore 2006), system enjoyment (SE) (Alwahaishi and Snásel 2013), system interactivity (Alrawashdeh, Muhairat, and Alqatawnah 2012) or result demonstrability (Godin and Goette 2013), and many other inclusions of independent variables and moderators.

UTAUT has been a viable tool of the acceptance surveys regarding various technologies contexts, like e-commerce (Pahnila, Siponen, and Zheng 2011), Internet banking (Chian-Son 2012), e-government (Alzahrani and Goodwin 2012) or social networking (Pardamean and Susanto 2012), and e-learning or m-learning (Mtebe and Raisamo 2014; Raman et al. 2014; Badwelan, Drew, and Bahaddad 2016; Shorfuzzaman and Alhussein 2016). Moreover, UTAUT allows researches from organisations to conduct studies from diverse perspectives by taking into account cross-cultural, cultural (Iqbal and Qureshi 2012; Arpaci 2015), and gender differences (Alfarani 2014).

E-Learning has become an important topic in recent IS developments under the new technological platforms as Virtual Reality and Virtual Learning Environments (VLE) (Shin 2017a). VLE is a computerised system aimed to enhance teaching and learning activities in a traditional educational setting (Shin, Biocca, and Choo 2013). VLE or more generally speaking e-learning environments work over the Internet and provide useful tools to instructors such as assessment, communication, management of class materials, collecting, organising students' grades, and others (Shin, Biocca, and Choo 2013). Rogers (2003, 474) defines diffusion of innovation as: 'the process in which an innovation is communicated through certain channels among the members of the social system' and is 'concerned with the spread of messages that are perceived as new ideas'. In many higher education institutions (HEIs), the diffusion of e-learning as an innovation is through communication of an e-learning strategy. Moreover, in the literature, there is an agreement on the importance of such a strategy implemented by the institution administration that states the goals of e-learning adoption within the institution (Maguire 2005; Mclean 2005). The provision of clear and well-communicated e-learning strategy prevents the disperse use of e-learning that occurs in small pockets (Mclean 2005; Stiles and Yorke 2007). Mclean (2005) argues that regardless of academics interests in technology, without communication of a clear vision, they may be very reluctant in seeking any of the e-learning activities. Moreover, the absence of an e-learning institutional strategy is emphasised as one of the main barriers that can restrict wider adoption of e-learning by academic staff.

The e-learning experience of the authors as well as the observations regarding e-learning limited use and slow proliferation made by the academicians at their university prompted authors to investigate academicians' e-learning adoption process. The received responses should have the influence on the substantial expanding of the interest in e-learning and its applications by the academic staff.

To solve this problem, UTAUT was proposed as a viable research model. It has been found that while TAM is capable of predicting technology adoption success by only 30% and TAM2 (TAM extension) can predict it by 40% (Oye, Iahad, and Ab. Rahim 2012), the combination of the variables and moderators in UTAUT model have increased the prediction representation considerably to 70% (Shaper and Pervan 2011).

However, there are some other reasons for selecting UTAUT for this study. Accordingly, we should agree with Marchewka, Liu, and Kostiwa (2007) that despite the high recognition of acceptance models like UTAUT, their validity in the information system context needs further investigation. In addition, Chun-Hua and Kai-Yu (2014) have empirically tested five TAMs and have found that UTAUT is the best model in the context of e-textbook acceptance which is a very similar context to the e-learning technology context in this study.

The common managerial concern is to know how the faculty perceive e-learning and how to improve adoption of e-learning among faculty. The existing managerial dilemma here is how to encourage faculty to adopt e-learning without having to use coercion or going against the faculty's actual beliefs. To do this, it is needed to understand factors that may encourage or discourage behavioural intention and usage behaviour. The main research question of this research is 'what factors define the behavioural intentions to adopt e-learning among university faculty members?' Overall, the research questions of this research are:

- What are the reasons of the growing e-learning popularity in general?
- What are the factors that influence the use of e-learning by academicians, in a developing country context?

The purpose of this research is to explore the factors that influence the way faculty in a developing country perceive e-learning, and how these perceptions then affect the behavioural intention to adopt e-learning. This study will also seek to test the UTAUT model in a HEI. The evaluation of these factors will help inform how they correlate to the rate of adoption and diffusion of this technology; given that, despite the numerous costs of e-learning, benefits that touch on the learning outcomes and the teaching-learning process have been recognised by institutions that have adopted e-learning. Research in to the factors that correlate to the adoption of e-learning could shed light on what the faculty and the university management need to do to encourage increased participation and usage. It is assumed that this could then result in increased faculty acceptance and usage, increased support from the sponsors and an

overall improvement in the implementation. The final results of this could be reaping the benefits of e-learning in a developing country case. The study of the faculty who has some knowledge of the government's policy on the use computers in education is based on the fact that they have a better experience of the technology, the learners, and the contents, and they have a great influence on where and how it is used. For example, the presence of a computer laboratory does not translate into actual usage unless the instructor encourages and enforces its usage.

This study also sought to test the UTAUT model in a developing country's HEI. In the process of analysing the determinants for the successful implementation and acceptance of this form of academic teaching, the new research model was proposed in this study. Its initiating point was the classic UTAUT model. Then, the authors proposed the modified UTAUT model containing besides four classical independent variables; also two new determinants – system interactivity (SIN) and area of scientific expertise (ASE) – were added. The moderators were omitted due to the existence of negative covariance. Such a modified UTAUT model was the matter of verification by Structural Equation Modelling (SEM). It revealed that two variables (SI and FC) should be excluded from the modified model because of their confirmed statistical insignificant influence on the behavioural intention to use e-learning. As a result, the authors propose the new modified version of the UTAUT model.

This research was driven by the need to solve the problems surrounding the adoption of e-learning by faculty members. There are many obstacles or barriers identified in the literature as deterrent for academics' use and adoption of e-learning. The classifications of barriers include external and internal source barriers (Rogers 2000), micro-macro-level barriers of the system of education (Balanskat, Blamire, and Kefala 2006; Tondeur et al. 2008), teachers' first-order extrinsic barriers and second-order or intrinsic barriers (Ertmer 1999; Snoeyink and Ertmer 2001; Albirini 2006), teacher-level and school-level barriers (Jones 2004), indirect and direct barriers (Hew and Brush 2007), non-material and material barriers (Pelgrum 2001), and other ways of classification (Hew and Brush 2007; Bingimlas 2009; Ertmer et al. 2012). Also, there is extensive literature on the adoption of technology in the general business settings, but there is a need to focus on specific fields such as higher education (Liu, Liao, and Pratt 2009). Majority of literature concerning the use of technology in the teaching and learning process focuses on the students, and many authors have identified the need to focus on other groups (Ndubisi 2006). Furthermore, many studies have focused on developing nations and little literature

exists on the non-Western world. The overall significance of this study was to provide a clearer understanding of the factors that influence the acceptance of e-learning technology among faculty in a developing country. The findings will be used to advance knowledge in defining factors influencing the adoption of e-learning and provide a strong foundation that can be used to create strategies for management and other stakeholders who are interested in successful implementation of e-learning.

The paper consists of four sections. After Introduction, the second section contains the comparative analysis of different publications in the acceptance models applied to e-learning. In the third section, the transformation from classical UTAUT model to research model was performed. In the fourth section of the paper, the research model was verified by testing ten research hypotheses. Finally, the major findings of this research are synthesised in the Conclusion section.

2. Background and related research

Because of its significance for academic institutions, scholars, and students, e-learning was the subject of many surveys of technology acceptance and adoption at universities. The comparative analysis of academic e-learning technologies acceptance accomplished by authors conducted mainly in academic institutions all over the world includes Germany (Emrich 2010), Indonesia (Pardamean and Susanto 2012), Nigeria (Oye, Iahad, and Ab. Rahim 2012), Pakistan (Waheed 2009), Saudi Arabia (Al-Shammari and Higgins 2015), Oman (Al-Naibi, Madarsha, and Ismail 2015), USA (Song 2010; Nicholson, Tokman, and Maniscalco 2014), and South Korea (Yoo, Han, and Huang 2012).

Ten criteria were employed for making such a comparison. An excerpt from the complete comparative schema is presented in Table 1. While the titles of certain columns express clearly its contents, some of them require explanations. First and foremost, adjustments of the selected model variables and moderators are: IV – independent variables, DV – dependent variables, EV – external variables, and M – moderators. Due to the quantitative nature of the specific questions in UTAUT questionnaire, a reliable and valid scale has been formed to assess the answers. Most of the researchers have used a 5-point Likert scale, but there are some exceptions. The specific notation was used for hypotheses verification – plus sign between constructs (e.g. PE + BI) means that the relationship between variables was significant, while minus sign used indicates that it is insignificant.

The analysis of the complete comparative analysis table confirms that the UTAUT method has become a

Table 1. The comparative analysis of international academic e-learning acceptance surveys.

No.	Auth./publ.	Country	Target group	Resp. no.	Acceptance model	Model variables/moderators	Data analysis methods applied	Hypothesis verification
1	Islam (2011)	Finland	University educators from Finnish University that use Moodle platform	175	Modified UTAUT	IV: Facilitating conditions (FC) grouped as: Access (ACCESS), Perceived behavioural control (PBC) and Compatibility (C); Performance expectancy (PE) and Perceived usefulness (PU); Effort expectancy and Perceived ease of use; Social influence DV: Continuance Intention (CI)	Descriptive statistics methods, PLS, composite reliability (CR), beta, significance test	• PU + CI • ACCESS + CI • C + CI • PBC + CI • PEOU + CI • SI + CI
2	Pardamean and Susanto (2012)	Indonesia	Students from Indonesian University	49	Modified UTAUT	IV: UTAUT standard minus Facilitating conditions (FC) DV: UTAUT standard plus Level of Actual Usage (LAU) M: Gender, Experience	Descriptive statistics methods, Cronbach's Alpha, standardise β -coefficients, significance test, R^2	• PE + BI • EE + BI • SI + BI • BI + LAU • Gender and experience have no impact on BI
3	Yoo, Han, and Huang (2012)	South Korea	Employees of mid-sized food service company in South Korea	226	Modified UTAUT	IV: (a) IM – Intrinsic motivators (effort expectancy, attitude toward use, and anxiety) (b) EV – extrinsic motivators (Performance expectancy, Social influence, and Facilitating conditions)	Descriptive statistics methods, Cronbach's alpha coefficient, CFA, SEM, GFI, AGFI, CFI, normed fit index, root mean square residual, beta, significance test	• IM + BI • EM + BI • EM + IM
4	Arenas-Gaitá, Rondan-Cataluña, and Ramirez-Correa (2010)	Spain	Students of a main University from the south of Spain	189 (66 males and 123 females)	Modified TAM, TAM2 and TAM3	IV: perceived usefulness (PU), perceived ease of use (PEOU) EV: result demonstrability (RES), perception of external control (PCE), perceived enjoy (ENJ) DV: behavioural intention, use of the e-learning platform (USE) M: Gender	Descriptive statistics methods, PLS, AVE, SEM, Cronbach's α coefficient, path coefficients (β), R^2 , p -values, regression coefficients (F -test), individual loads (λ)	• BI + USE • ENJ + PEOU • PCE + PEOU • PEOU + ITU • PEOU + PU • PU + ITU • RES + PU • no statistically significant differences between males and females

popular tool in Information Systems research all over the world in countries with different development levels. Modifications of the classical UTAUT model concern supplementing it with additional independent variables and determinants and/or resigning of the classical determinants and moderators. In the excerpt in Table 1, only the selected typical cases are included. The target group examination revealed that acceptance surveys using questionnaires were conducted among academicians, students, academicians, and students, or university educators teaching employees of different sectors. An interesting result emerged from the comparison in column 4 – number of respondents of survey. They differ from 49 to 932, on average, about 120. Independently of the number of respondents, UTAUT supported by its statistical instruments was fully applied in each case. As column 5 shows, the acceptance research studies were accomplished using first and foremost modified UTAUT.

The classical four UTAUT independent variables were not used in the overall modified models. The researchers quite often refrain from including two determinants – social influence (SI) and facilitating conditions (FC). In turn, the moderators in general are not included by the authors in their modified UTAUT proposals. In few models, two moderators – gender and experience – were included. On the other hand, a 5-point Likert scale is used commonly in the mentioned models. While in the original UTAUT nine hypotheses were verified, in these models, usually only three hypotheses have been tested. The last column of Table 1 includes the results of hypotheses verification.

The technology acceptance researchers proposed a number of new independent variables (determinant) like anxiety (AX), self-efficiency (SE), perception of external control (PCE), computer efficiency (CE) or intrinsic motivators (IM), and many others. Independent variables (IV) in some modified UTAUT models are described, defined also by the external variables (EV). Some types of EVs are result demonstrability (RES), Image (I), System flexibility (SF) or extrinsic motivators (EM). External variables are a new type of variables in relation to the classical UTAUT model. They are identified as the ones that have an indirect impact on dependent variables (DV) and a direct impact on independent variables (IV).

Oye, Iahad, and Rahim, in their modified UTAUT model, pointed out the strong relation between attitude towards use (ATU) and behavioural intention to use ICT (BI) in the context of online teaching (Oye, Iahad, and Ab. Rahim 2014). Waheed indicated that facilitating conditions (FC), perceived ease of use (PEOU), computer efficiency (CE), and perceived usefulness (PU) have a different impact on the intention to use (ITU) e-learning

technologies, measured by a significance indicator, respectively: FC = 0.0; PEOU = 0.0; CE = 0.019; PU = 0.0 (Waheed 2009).

As stated in several surveys, the variable–effort expectancy has both positive (Liao, Yu, and Yi 2011; Alrawashdeh, Muhairat, and Alqatawnah 2012) and negative (Pardamean and Susanto 2012) influence on the behaviour intention to use e-learning technologies. It can be interpreted that this contradictory conclusion regarding the same variable is dependent on the cultural setting. It indicates that further research should be conducted in finding new moderators for EE or finding new external variables for it.

3. Research model

The aim of the comparative analysis of e-learning acceptance research was the review and the assessment of independent and external variables, moderators, and hypotheses, which refer to this academic field of activity. They were analysed based on the Turkish academics' long-term experience of using e-learning technologies in the daily academic practice. They prove that there is still necessity to search for new factors that influence the intention to use e-learning for university modern teaching.

Taking into account the above comparative results and authors' long-term e-learning experience, the authors during the brainstorm sessions selected the set of variables and moderators. Consequently, the proposed research model includes four UTAUT classical independent variables (PE, EE, SI, and FC) and two new original ones: system interactivity (SIN) and area of scientific expertise (ASE). The SIN was recognised as an important factor of e-learning acceptance. It is understood as the perceived interactivity, flexibility, and intuitiveness in using e-learning technologies to cooperate with academics. Of course, the feature strongly depends on the software used – open source or commercial e-learning platforms.

The second new independent variable – ASE – results from the fact that the research was conducted among all units of the university. Some its specialisations, faculties like informatics are using ICT technology in their daily didactic and scientific work, while for the scholars of the other specialisations, e-learning is a bit distant, this being not a regular teaching technology. Therefore, they demand extra courses to achieve fluency in online teaching. In general, ASE can be defined as the degree to which a scholar believes that using e-learning technologies fits and improves teaching at their specific scientific field. In the result, the proposed research model looks like what is presented in Figure 1.

The independent variables and moderators' impact at behavioural intention were statistically verified under the

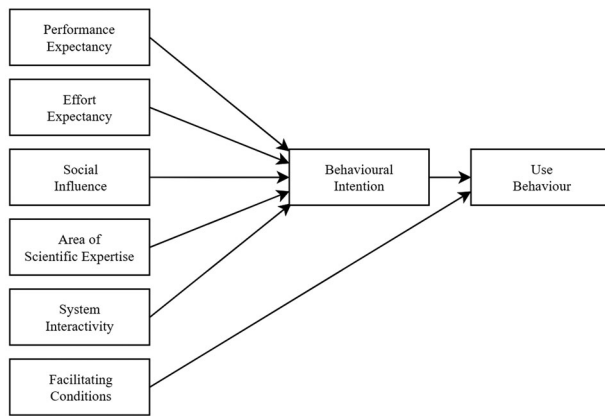


Figure 1. Preliminary version of modified UTAUT model of academic e-learning acceptance.

criterion of significance of the relationships among them. These analyses, evaluations, and interpretations of final relationships were conducted and received with the use of SEM. The SEM was based on continuous fit confirmatory factor analyses (CFAs), which excluded:

- observed variables which impact on unobserved variables were lower than 0.5;
- observed variables, where residual covariances were higher than 1.4; and
- connections between unobserved variables, where the relationship was not significant.

In the result, the following determinants were excluded from the preliminary version of modified UTAUT model: social influence (SI) and facilitating conditions (FC). The moderators were removed from the preliminary model version due to the existence of negative covariance for them. Finally, the research model has been developed in the form presented in Figure 2.

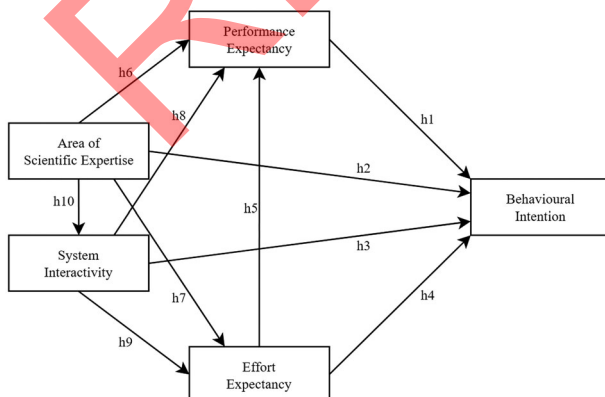


Figure 2. Research model.

The research model according to Figure 2 contains

- 3 independent variables (IV): performance expectancy, effort expectancy and system interactivity;
- 2 external variables (EV): area of scientific expertise and system interactivity which is also IV;
- 1 dependent variable (DV) – behavioural intention; and
- 10 relationships between independent variables, external variables, and dependent variable.

The relationships are equivalent to ten research hypotheses, indicated in Figure 2 and formulated in Table 2.

4. Model validation

The current study is based on a questionnaire survey with using the computer-assisted web interviewing method. The invitation to the survey with link to the questionnaire was sent to 242 scholars using the university e-learning platform. Data were collected in two weeks. Eventually, 82 academicians successfully completed and returned the questionnaire (response rate = 34%). The first section included questions regarding the characteristics of respondents. The second part of the survey included 27 questions: 3–4 questions for each determinant expressed in the preliminary UTAUT model (Figure 1). Each question was measured using a 5-point Likert scale (1 = strongly agree, 2 = agree, 3 = neither agree nor disagree, 4 = disagree, 5 = strongly disagree).

Regression analysis was used to verify the influence of the four proposed variables of research model – PE, EE, SIN, and ASE on BI (Figure 2). Results were used to accept or reject the stated null hypotheses (Table 2). IBM SPSS Statistics 21 was used for computing the reliability coefficients and the explanatory factor analysis (Chin 1998; Tenenhaus et al. 2005). SEM was employed to assess the direct and indirect effects between exogenous and endogenous variables of the complex model structure (Kline 2005).

Data validity analyses indicated that all 82 cases (100%) were valid. The validity was concerned with regard to reducing the possibility of getting incorrect answers during the data collection period (Sekaran 2003). Inter-construct correlation coefficient estimates were examined along with item's internal consistency reliability by using Cronbach's alpha coefficient estimates (Thompson 2003; Cronbach and Shavelson 2004). Table 3 includes the relevant results.

Generally, as stated by Sun and Zhang (2006), reliability numbers greater than 0.6 are considered acceptable in technology acceptance literature. All

Table 2. Research hypotheses.

Hypothesis number	Connection	Description
H1	PE + BI	Performance expectancy has direct and positive effect on the intention to use e-learning technologies
H2	ASE + BI	Area of scientific expertise has direct and positive effect on the intention to use e-learning technologies
H3	SIN + BI	System interactivity has direct and positive effect on the intention to use e-learning technologies
H4	EE + BI	Effort expectancy has direct and positive effect on the intention to use e-learning technologies
H5	EE + PE	Effort expectancy has a direct and favourable impact on perceived performance expectancy
H6	ASE + PE	Area of scientific expertise has a direct and favourable impact on perceived performance expectancy
H7	ASE + EE	Area of scientific expertise has a direct and favourable impact on perceived effort expectancy
H8	SIN + PE	System interactivity has a direct and positive impact on perceived performance expectancy
H9	SIN + EE	System interactivity has a direct and favourable impact on perceived effort expectancy
H10	ASE + SIN	Area of scientific expertise and positive has a direct impact on perceived system interactivity

items have exceeded this threshold. Our research instrument confirmed that data are internally consistent and valid, having the total reliability score equal to 0.854.

The final model of this study was obtained by including items exclusion process. In order to assess the overall metric model, fit CFAs were performed. Five measures have been applied, namely: ratio chi-square to degrees of freedom ($\chi^2/\text{d.f.}$), Goodness-of-fit index (GFI), Root Mean Square of Error Approximation (RMSEA), Comparative Fit Index (CFI), and Adjusted Goodness-of-fit Index (AGFI). Consequently, the tested model meets all required goodness-of-fit measures as presented in Table 4.

Regression analysis was used for 10 stated hypotheses testing. Their confirmation was examined by path coefficients (standardised $\beta \geq 0.2$ were accepted) and their significance levels ($p < .05$) were accepted. Table 5 shows the overall results of hypotheses verification.

Furthermore, as shown in Table 6, indirect effects were measured to explain the behaviour intention to use e-learning technologies by academicians in more detail. This enabled also to measure the total effects for determinants.

The findings of this study revealed that most of the proposed relationships were accepted as statistically significant. Figure 3 explains the elaborated structural

model with path' coefficients (β), significance (p), and the adjusted coefficients of determination (R^2) scores. The dashed line refers to statistically non-significant relation.

The first hypothesis (H1) explored the relationship between how users perceive the usefulness of the e-learning and how this perception impacts on their behavioural intention to adopt this technology. Performance expectancy is a variable that looks at the degree to which an individual believes that using a technology can help him attain gains in his performance on the job (Venkatesh et al. 2003). The items in the survey focused on whether technology makes the work easier, improves productivity, and helps to achieve the tasks more quickly. Specifically adapted to the teaching and learning environment were items on whether e-learning is useful to teaching, improves the quality of the teaching, improves attention, retention and testing, as well as group discussions.

This hypothesis was accepted since the statistical results showed that there is a strong significant relationship between the performance expectancy and educators' intention to use e-learning technologies (0.434*)

Table 3. Reliability analysis results.

Variable	Cronbach's alpha	Cronbach's alpha based on standardised items
PE	0.869	0.876
EE	0.767	0.770
ASE	0.630	0.632
SIN	0.837	0.838
BI	0.841	0.857

Table 4. Fit indices of the research model.

Fit indices	Recommended value/by		Result
$\chi^2/\text{d.f.}$	<3	Bollen and Liang (1988)	1.29
GFI	>0.8	Bollen (1989)	0.887
RMSEA	<0.08	Browne and Cudeck (1993)	0.06
CFI	>0.9	Smith and McMillan (2001)	0.965
AGFI	>0.8	Bollen and Liang (1988)	0.813

Table 5. Hypothesis verification results.

Hypothesis	Path	Standardised β -coefficients
H1*	PE + BI	0.434
H2	ASE - BI	0.026
H3*	SIN + BI	0.353
H4	EE - BI	-0.187
H5*	EE + PE	-0.270
H6**	ASE + PE	0.512
H7*	ASE + EE	0.429
H8***	SIN + PE	0.539
H9	SIN - EE	0.105
H10*	ASE + SIN	0.364

* $p < .05$.

** $p < .01$.

*** $p < .001$

Table 6. Indirect effects between variables.

Variable	ASE	SIN	EE
BI	0.298	0.203	-0.117
EE	0.038		
PE	0.070	-0.028	

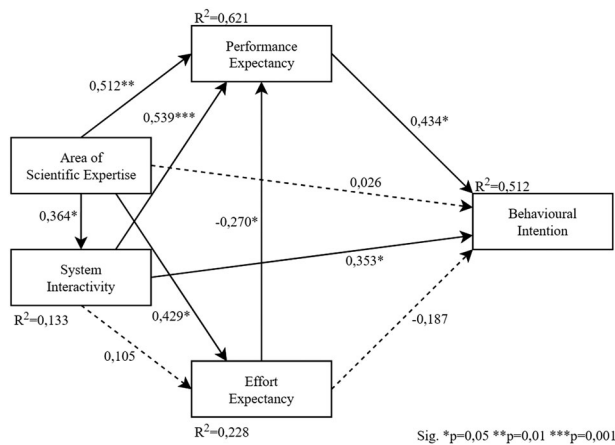


Figure 3. Research model – verification results. * $p = .05$; ** $p = .01$; *** $p = .001$.

(Figure 3). The meaning of the stars is as follows: *** – very significant impact, ** – strongly significant impact, and * – significant impact. It implies that academicians find e-learning technologies as useful for improving their teaching performance, and as a way to increase the possibilities of communication with students and other instructors. It confirms that academicians regard e-learning technologies as a tool that can extend and enhance the way they perform their tasks. The more useful e-learning is perceived to be, the more the intention to adopt it. In the light of such a finding, the usefulness of e-learning should be a factor to consider and emphasise when developing applications and implementing the technology.

This finding supports the previous literature on performance expectancy that it is a useful indicator of technology adoption as in the original UTAUT model (Venkatesh et al. 2003), irrespective of the culture (Al-Gahtani, Hubona, and Wang 2007; Bandyopadhyay and Fraccastoro 2007; Venkatesh and Zhang 2010).

On the other hand, the relationship between effort expectancy and behavioural intention to use e-learning technologies is not significant ($\beta = -0.187$, $p = .215$) (Table 5); hence, the second hypothesis (H2) is not supported. The result is consistent with findings in some of the previous studies (Dasgupta et al. 2007; Sedana and Wijaya 2010). In contrast, there are other studies that reported a significant influence between these two factors (Venkatesh et al. 2003; Chen, Wu, and Yang 2008). This indicates that the perceived level of effort required to be able to use e-learning technologies is not important for educators during decision about utilising them.

According to the results of H2 verification, effort expectancy does not have an impact on the behavioural intention; yet, confirmed H5 proves that effort

expectancy has an indirect impact on the intention to use e-learning technologies (-0.117) (Table 6) with a direct impact on performance expectancy (-0.270^*). It confirms the findings of Taylor and Todd (1995); Šumak, Polancic, and Hericko (2010); and Alrawashdeh, Muhairat, and Alqatawnah (2012) who indicated that effort expectancy (ease of use) affects the performance expectancy (usefulness) and the user attitude. It highlights that academicians perceive benefits gained by using e-learning technologies for tutoring also from the perspective of required effort to be able to utilise them. Results in Table 6 represent that the higher the level of demanded effort, the lower the perceived performance expectancy.

Based on confirmed third hypothesis (H3), this study provides evidence that system interactivity has a direct effect on the behaviour intention to use e-learning technologies (0.353^*). This is convergent with Alrawashdeh, Muhairat, and Alqatawnah (2012). Thus, as presented in Table 5 and Figure 3, system interactivity and performance expectancy are the only factors that have a direct impact on BI. It indicates that academicians wish to use e-learning technologies in education as long as they perceive their interface as interactive, flexible, and intuitive to use and cooperate with students. SIN also has a very significant and strong direct effect on the performance expectancy (0.539^{***}), which confirmed H8. This means that educators intend to use e-learning to interact with students and other academicians, as they believe that e-learning technologies will enhance their teaching performance and make running courses easier. This result is contrasting with the outcomes of Abbad, Morris, and Nahlik (2009), but similar to Yiong, Sam, and Wah (2008). In this context, surprisingly, H9 is not confirmed ($\beta = 0.105$; $p = .469$) that system interactivity has no impact on effort expectancy. It means that academicians do not perceive that interactivity of communication and flexibility has influence on their effort to use e-learning technologies. It is worth to highlight that SIN has the strongest total (direct plus indirect) effect on BI (0.556).

The second relationship (H2) associated with the elaborated variable revealed that the area of scientific expertise does not have a direct effect on the academicians' intention to use e-learning technologies, as the connection is not significant ($\beta = 0.026$; $p = .888$). Confirmed H2 does not mean that the area of scientific expertise does not have any influence on the behavioural intention, as H6, H7, and H10 have been confirmed, and showed that ASE has an important indirect impact on BI (0.298) (Table 6). As presented in Figure 3, it is due to the direct relation between ASE and: PE (0.512^{**}), EE (0.429^*), as well as SIN (0.364^*). In particular, according to H6, academicians consider performance

expectancy gained by using e-learning technologies as strongly related to didactic or research field. This finding points out to the demand of proper e-learning technologies promotion among universities employees that is matched to requirements of particular faculties or even departments, strictly connected to conducted education. The same situation is confirmed for the relationship with EE (H7) and SIN (H10). Academicians' perceived level of effort expectancy for using e-learning technologies and their interactivity is dependent on the use context, which is directly responding to didactic and research area. It can be interpreted that training educators in the area of using e-learning technologies should be customised according to particular faculties, departments, and research fields. An elaborated model as presented in Figure 3 explains 51 percent of variance in the behavioural intention to use e-learning technologies.

5. Conclusions

E-learning is gradually being adopted in HEIs. Many technology adoption models have been developed to help explain the factors that can help increase the take up of this technology. TAM and UTAUT are some of the models that have been developed and widely validated in the Western contexts. The purpose of this research was to explore the factors that influence the way faculty in a developing country perceive e-learning, and how these perceptions then affect the behavioural intention to adopt e-learning. This study employed a modified UTAUT model and integrated additional constructs as system interactivity and area of scientific expertise. Also, additional relationships between the variables were included in the new modified research model. Thus, the research contributed to the development of context-specific and verified-modified UTAUT model by utilising previous adequate studies and resulting findings. This study also sought to test the modified UTAUT model in a developing country's HEI.

5.1. Implications

This study enables us to draw several conclusions. First, it revealed that the academicians intend to use e-learning technologies mainly to improve their efficiency of teaching since performance expectancy has the strongest direct effect on educators' intention to use e-learning technologies. Second, system interactivity occurred to have a significant impact on intention to use e-learning technologies, with a total effect even greater than performance expectancy. This means that e-learning technologies' designers should ensure that the system's components are highly interactive and intuitive to use.

This can be also interpreted as an indication that users of teaching platforms have a strong and precise control over the system. Probably, academicians prefer to customise e-learning environments. In turn, e-learning technologies' interfaces have to convince scholars that they have a positive impact on the effectiveness of teaching and learning activities.

Research confirmed that effort expectancy has a direct impact on perceived PE. In the context of the analogical effect confirmed for system interactivity, it means that academicians expect from e-learning technologies low or moderate time efforts to learn its functionalities. It states also that e-learning technologies' interfaces and functions should be as interactive and simple as possible.

It appeared also that the newly included variable – area of scientific expertise – does not have a direct impact on the intention to use e-learning technologies. But this research confirmed hypotheses related to the effects of performance expectancy, effort expectancy and system interactivity, and also indirectly influences behavioural intention to use e-learning technologies. This interpretation indicates that there is a need to analyse e-learning technology users' needs based on scientific (didactic) specialisation to highlight particular factors that are important and may convince to utilise e-learning technology by a larger number of academicians.

The area of technology adoption continues to draw attention due to the wide range of technology, their applicability, and the fast growth, but also due to the costs involved with developing the technologies, and the complications that may arise at the implementation and adoption stage. To deal with this, managers should focus on adoption factors. For example, it is evident from this study that performance expectancy is an important factor. Managers should ensure that the benefits and usefulness of the e-learning technology are given required attention.

System interactivity has come out as a very important factor in this research. Managers must therefore counter this by ensuring interactive and flexible e-learning platforms, regarding the software used on e-learning platforms.

5.2. Limitations

There was a limitation on the research approach. This study used a quantitative methodology, gathering survey data and analysing it to get the results and reach conclusions. Since the study deals with human subjects and deals with their perceptions, a mixed-methodology approach might have provided deeper insights and allowed participants to express themselves in a better manner.

The sampling frame introduced some degree of bias. Participants were from several universities that have implemented e-learning in different stages. They all understood the performance benefits of this new tool, yet the same would be argued for the faculty members teaching in universities where the same level of implementations is not available. The population was also young and well educated, and exposed to the Internet. They were therefore well equipped to deal with e-learning acceptance and adoption process that could create further bias in our dataset.

5.3. Further research

Given that this study identified the adoption factors for e-learning, and that some limitations emerged from the study itself, there are a number of recommendations for future research.

Future research can focus on the role of facilitating conditions as tested in Venkatesh et al. (2003). This was not tested in the study, although a question on where faculty access computers pointed more towards home than classrooms or computer laboratories, and this needs to be tested to find out whether it is in any way linked to facilitating conditions. Multitasking conditions and tools can also be considered since they could improve information processing, hence ultimately, the learning process (Shin, An, and Kim 2016). Therefore, similar factors that could enhance e-learning process shall be considered in further studies.

There is a need to look at the actual usage as a dependent variable. This study assumed that behavioural intention is a good indicator of usage. A question on the applications that faculty use more often painted a gloomy picture on the usage of learning management systems, with 31% accessing the technology occasionally, 23% never accessing it, and only 10% accessing it daily, 14% accessing every 2–3 days, 17.5% accessing it once a week, and 2.6% accessing it once a month. The applications that receive the best responses are word processing, email, and Internet. There is a need to establish whether these are used for educational purposes. This indicates the need to establish whether the behavioural intention does actually translate into actual usage.

There is also need to carry out a longitudinal study of the same population, and using a mixed-method approach. Such an approach could give more realistic reasons for faculty members adopting and using e-learning technologies in their classrooms. For example, Shin, Lee, and Hwang carried out a longitudinal study of acceptance and adoption of healthcare Information Systems by incorporating very interesting and useful constructs such as trust, utility, and credibility (2017). Further studies can

be designed in a similar methodology with the same or some other useful and interesting constructs.

Disclosure statement

No potential conflict of interest was reported by the authors.

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