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Applying the Technology Acceptance Model to Online Learning in the Egyptian Universities

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Abstract

The purpose of the research is to identify the determinants of students' acceptance of online learning and to investigate how these determinants can shape students' intention to use online learning. A conceptual framework based on the Technology Acceptance Model (TAM) was modified. A questionnaire was developed and used to solicit information from the 153 undergraduate students who used online learning in DBMU. The results reveal that students' perception of ease of use, usefulness, attitudes towards online learning, and the social influence of students' referent group were identified as significant determinants of students' intention to practice online learning. The possibility of using the social influence of students' referent group, students' perceived ease of use, students' perceived usefulness and their attitudes towards online learning to predict their behavioral intention to use online learning was also confirmed.

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1. Introduction

Rapid technological developments have increased society's dependence on information technology. One of technology variants is the online learning technologies, which is defined as "the use of the Internet to access learning materials; to interact with the content, instructor, and other learners; and to obtain support during the learning process, in order to acquire knowledge, to construct personal meaning, and to grow from the learning experience (Ally, 2004, P. 5)". Higher education institutions have increasingly embraced online learning world wide in order to realize different educational benefits such as: facilitating information exchange and collaborative learning, improving the quality of teaching and learning, improving access to education and training, realizing flexibility for time and place, responding to labor market conditions and to innovation technology itself, preparation for lifelong and self-paced learning while at the same time reducing costs and improving the overall cost-effectiveness of educational services (Keller & Cernerud, 2002; Liu, Liao & Chung Yuan, 2005; Shen, Laffey, Lin & Huang, 2006; Saadé & Kira, 2009; park, 2009). However, implementing a technology that is not willingly accepted and used by users exhaust resources and wastes time and money (Cowen, 2009). The user acceptance of a new information system, such as online learning, is considered the essential factor that determines the success or failure of this system (Davis, 1993). Hence, it is crucial for any university to know, before the

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implementation of online learning, if the shift to online learning technologies is what the students want and accept (Jung, Loria, Mostaghel & Saha, 2008; Yee, Luan, Ayub & Mahmud, 2009).

Due to the unique characteristics of online learning, Mansoura University and its branch in Damitta, as many Egyptian universities, continue to invest large amounts of financial resources and exert intensive efforts to implement online learning. Although these efforts resulted in quantitative growth of e-courses that become online available, the students are reluctant to practice online learning (ICTP, 2010). Therefore, the purpose of the research is to identify the determinants of students' acceptance of online learning and to investigate how these determinants can shape the students' intention to use online learning in DBMU. The research seeks to answer the following questions:

1. What are the determinants of students' acceptance to use online learning?
2. To what extent do these determinants exist among students of DBMU?
3. What are the relationships between these determinants?
4. What are the underlying influences of these determinants on students' intention to use online learning?

2. Significance

This research adds to the existing literature through identifying factors affecting students' behavioral intention to learn online, and through introducing a conceptual framework that examines the influence of each factor on students' behavioral intention to use online learning platform. Examining the relationships between these variables will provide those responsible for the management and development of online learning programs with important information about how students perceive and react to online learning so that they can enhance the effectiveness of online learning and create mechanisms for attracting students to adopt it.

3. Literature review

3.1. Determinants of students' acceptance of online learning

Research on e-learning involves several studies that investigated the influence of some students' attributes on their acceptance and usage of online technology. Students' preference for an online delivery system could be attributed to their perceived ease of use which would be evident from their competence in using internet and electronic communication, alongside their ability to engage in autonomous learning. The individuals' perception of the usefulness of online learning is an additional attribute that may increase their academic success in an online environment (Proffitt, 2008, p.18). Furthermore, the social influence of students' referent groups, student's attitude towards online learning are additional factors related to individuals' attributes and may influence their intention to learn online. (Berteau, 2009; Shen, Laffey, Lin & Huang, 2006) The users' actual usage of the technology is strongly influenced by their behavioral intention, which in turn is influenced by their prior experience with this technology (Sumak, Hericko, Pusnik & Polancic, 2011). The aforementioned attributes (students' perceptions of usefulness and ease of use, attitudes and social influence factors) could shape the determinants of students' acceptance and intention to use online learning. These determinants are relevant to the technology acceptance model (TAM).

3.2. TAM

TAM has gained considerable support in understanding and managing the process of new technology adoption (Chen, Chen, Lin & Yeh, 2007; Dillon & Morris, 1996; Masrom, 2007; Park, 2009). TAM was introduced by Davis (1989) to be used in predicting the user acceptance of any information technology system and to diagnose design problems before the users actually use this system through two factors: perceived usefulness (PU) and perceived ease of use (PEU) (Dillon & Morris, 1996; Chen, Chen, Lin & Yeh, 2007). According to Lee, Cho, Gay, Davidson and Ingraffea (2003), perceived usefulness is defined

as "the degree to which a person believes that use of technology will produce better outcomes". This means if students perceive that the online learning system can help improve their performance, they are more likely to use online learning in their learning process (Yee, Luan, Ayub & Mahmud, 2009). PEU explains the user's perception of the amount of effort required to utilize the system or the extent to which a user believes that using a particular technology will be effortless (Alrafi, 2009). Within the current research, PEU is a student's perception about the degree of effort needed to learn online.

The core idea of TAM is that user's acceptance of technology is determined by his/her behavioral intention, which in turn is determined by his/her PU and PEU (Wu, 2009). Behavioral intention (BI) is used to express "the extent to which a student formulates conscious plans to use or not to use online learning related activities (Ramayah & Ignatius, 2005; Clement & Bush, 2011, and Li & Huang, 2009). BI is strongly related to the person's actual behavior; in other words: "if a person intends to do a behavior, then it is likely to be done". Also, TAM suggests that users formulate a positive attitude toward technology when they perceive it to be useful and easy to use (Lee, Cho, Gay, Davidson & Ingraffea, 2003). Based on TAM, higher levels of PU and PEU predict favourable attitudes which, in turn, predict intentions to use (Lucas, 1997). One's actual use of a technology system is influenced directly or indirectly by the user's behavioral intentions, attitude, perceived usefulness of the system, and perceived ease to use the system (Park, 2009, p.151).

TAM was updated many times to empirically verify particular assumptions. For instance, Venkatesh and Davis (1996) dropped the attitude construct from the original model, as they supposed it does not fully mediate the relationship between both perception constructs (i.e. perceived ease of use and perceived usefulness) and behavioral intent (Kim, Chun, , Song (2009). Similarly, Masrom (2007) dropped the actual use from the original model. On the other hand, Lee, Cheung and Chen (2005) included perceived enjoyment as an intrinsic motivator into TAM in order to examine the impact of perceived enjoyment on both students' attitude and intention to use internet-based learning. However, only few researchers have tried to account for the influence of different referent groups on individuals' behavior (i.e. Park, 2009; Shen, Laffey, Lin & Huang, 2006).

3.3. Social influence and research framework

Shen, Laffey, Lin and Huang (2006) highlighted the social influence on students' attitudes and on their actual behavior within online learning environment. According to Kripanont (2007, p. 87), social influence (SI) is defined as "the degree to which an individual perceives that other important persons believe he/she should use the system".

The student's referent group plays an essential role in shaping his/her behavior. A referent group is defined as "a social group that is important to an individual and that, consequently, influences his/ her beliefs and behaviors (Mackie & Queller, 2000, p. 138)". The referent group of online students includes instructors, peers and/or other supporters (e.g., teaching assistants, mentors, and family members) (Shen, Laffey, Lin & Huang, 2006). The current research update TAM in order to include and examine the possible social influence of the students' referent group (namely: instructors/ mentors, peers, and family members) and other related constructs such as PU, PEU, ATT towards online learning on students' behavioral intention to use online learning. Figure 1 depicts the conceptual model of the current study.

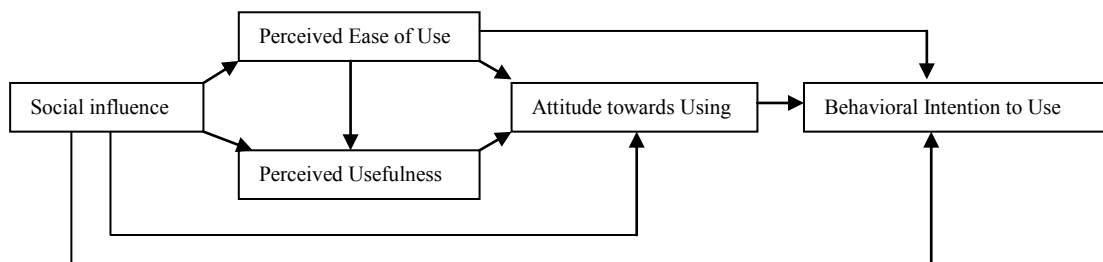


Figure 1 Conceptual model of the research

This conceptual model is a simple flow chart illustrating the hypothesized relationships between research constructs that constitute the key determinants of students' intention to practice online learning. These determinants are: social influence of referent groups, PU, PEU and attitudes towards online learning ATT.

4. Hypotheses

The results of previous studies, alongside the literature review, were employed to develop the following hypotheses:

- H1: The social influence of the students' referent groups has positive relationships with students' PU, PEU, ATT, and their BI to learn online.
- H2: The social influence of the students' referent groups, PE, PU and ATT are positive predictors for the students' intention to learn online.
- H3: The social influence of students' referent groups is the strongest predictor for students' intention to learn online.
- H4: students' PU and PEU are positive predictors for their attitudes towards online learning
- H5: students' PEU positively influences their PU of online learning.

5. Method

5.1. Instrument

For the purpose of this study, a structured questionnaire was developed based on similar instruments as cited in literature (i.e. Kripanont, 2007; Jung, Loria, Mostaghel & Saha, 2008; Masrom, 2007). The final version of the questionnaire included 42 items to measure the five constructs of the research model; SI (five items), PEU (twelve items), PU (eight items), ATT towards online learning (eleven items), and BI to use online learning (six items). All items required seven-point Likert-style responses ranging from 1= "strongly disagree" to 7= "strongly agree".

5.2. Validity and Reliability

Content validity was established based on the opinion of two experts in the field of e-learning, besides piloting the questionnaire on a sample of 17 third year students of Damietta Faculty of Education. Feedback led to changing some items of the questionnaire, in addition to eliminating three items. The reliability of the questionnaire was measured for each construct using Cronbach's alphas. Reliability level was found to be above the recommended minimum standard of 0.60 for all five measures. The calculated Cronbach α were: PEU=0.69, PU=0.73, ATT= 0.61, BI= 0.73, SI=0.65.

5.3. Context and sampling

A central e-learning unit was established in DBMU in September 2009 in order to organize the process of managing and producing e-courses and uploading them on the web site of the university based on Moodle as a learning management system. By September 2009, there were 3 e-courses which became available online for the students of DBMU. One of these three courses is the "Instructional Technology 2" that targeted the students who were registered in the third year in Damietta faculty of Education within the academic year 2010/2011. As 640 students were found to be registered in the registration list, a purposive sampling method was used in the sample selection to ensure that only students who have previous experience (even short) with online learning in June 2010 participate in the study. Only 153 students out of 640 (24%) were selected because they used online learning in studying the e-course "Instructional Technology". There were 135 females (88.2%) and the mean age of all participants was 21.9 years.

5.4. Procedures

In June 2010, after the students finished their final exams, the survey was administered to the students of the research sample. The students were asked to respond to the questionnaire. 141 participants returned the instrument with a return rate of 92.16%, of which 20 were excluded as they were incomplete. The responses of the students on each item were coded from 1= "strongly disagree" to 7= "strongly agree". The negative items were reversely coded for the purpose of statistical analysis. The scores from the items on each construct were calculated so that each participant got a score on each construct.

6. Results and discussion

6.1. PU, PEU, BI and ATT towards online learning

Students' PU, PEU, ATT towards online learning, and their BI to use online learning, were identified as the determinants of individuals' acceptance and usage of online learning. Descriptive statistics were conducted to identify the status of these determinants between research participants. Table 1 summarizes the frequency of the participants' scores based on their responses on the four constructs of the questionnaire.

Table 1 descriptive statistics of participants' scores on the constructs of ATT, PU, PEU, and BI

	means	scores	Frequency	percentage
ATT	45.5	20-46	57	52.5%
		47-68	63	47.5%
PU	38.22	8-39	66	55%
		40-56	54	45%
PEU	40.15	17-41	62	51.6%
		42-65	58	48.4%
BI	22.19	6-23	72	60%
		24-40	48	40%

As depicted in Table 1, students' scores on the items that measure their attitudes towards online learning range from 20 to 68 with mean of 45.5. Students' who got scores from 20-46 were classified as having "negative" ATT whereas students who got scores more than 46 were classified as having "positive" ATT towards online learning. As the scores of 52.5% of participants ranged between 20-46, it could be concluded that students of DBMU tend to have negative attitudes towards using online learning.

In respect to students' scores on the items measuring their PU, table 1 shows that students scores range from 8-56, with mean of 38.22. The range of students' scores from 8-39 was considered to reflect low level of students' PU, whereas the range of students' scores from 40-56 was considered to reflect their perception of usefulness. As the scores of 55% of the sample ranged from 8-39, therefore the students of DBMU could not be conceived as perceiving the usefulness of online learning.

Concerning the construct of PEU, students' scores range from 17-65, with mean of 40.15. Scores from 17-41 were classified as "not perceiving ease of use", however scores from 42-65 were classified as "perceiving" the ease of using online learning. Based on the results in table 1, 51.6% of research participants do not perceive the easiness of online learning which leads to the conclusion that the students of DBMU do not perceive online learning as easy in use.

Concerning participants' scores on the construct of students' BI, the scores range from 6-40 with mean of 22.19. Students who got scores from 6-23 were considered as not having BI to use online learning. However, students who got scores from 24-40 were considered as having intention to use online learning. As shown in table 1, 60% of the participants do not have BI to use online learning. Therefore the students of DBMU tend to be reluctant in using online learning.

PEU among students of DBMU may diminish their PU and their positive ATT towards using online learning, and in turn decline their intention to practice online learning. The following are the correlations between these constructs and the SI of students' referent group.

6.2. Relationships between different determinants of students' intention to learn online

Pearson's correlation was conducted to find out the relationships between the participants' scores on the measures of SI of students' referent groups, PU, PEU, ATT, and BI. Table 2 illustrates the correlations between SI, ATT, PU, PEU and BI.

Table 2 Correlations between SI, ATT, PU, PEU and BI

Variable	SI	ATT	PU	PEU	BI
SI	--	0.452**	0.369**	0.410**	0.551**
ATT	--	--	0.616**	0.502**	0.663**
PU	--	--	--	0.581**	0.625**
PEU	--	--	--	--	0.594**
BI	--	--	--	--	--
Mean	17.483	45.577	38.225	40.156	22.192
Std. deviation	6.872	9.739	10.456	11.634	8.805

Note. ** $p < .01$. $n = 120$

Correlations presented in table 2 reveal positive and significant relationships between all research variables; SI and ATT ($r=0.452$, $P<0.01$), SI and PU ($r=0.369$, $P<0.01$), SI and PEU ($r=0.410$, $P<0.01$), SI and BI ($r=0.551$, $P<0.01$), PU and PEU ($r=0.581$, $P<0.01$), PU and BI ($r=0.625$, $P<0.01$), ($r=0.452$, $P<0.01$), ATT and PU ($r=0.616$, $P<0.01$), ATT and PEU ($r=0.502$, $P<0.01$), ATT and BI ($r=0.663$, $P<0.01$). Therefore the first hypothesis, "Social influence of students' referent group has positive relationships with students' PU, PEU, ATT, and their BI to learn online", was supported. However, a high value of correlation was found between ATT and BI ($r=0.66$, $P<0.01$), which means the higher positive attitudes students have, the more behavioral intention to learn online they get. Similar conclusions could be inferred from the correlations between PU and BI ($r=0.63$, $P<0.01$) and between ATT and PU ($r=0.62$, $P<0.01$).

6.3. SI of students' referent group, PEU, PU, and ATT on students' BI to use online learning

Standard multiple regression analysis was conducted to explore the SI of students' referent groups, PE, PU, and ATT on students' BI to learn online. The dependent variable was the BI, whereas the independent variables were SI of students' referent groups, PEU, PU, and ATT. Table 3 depicts the results of multiple regressions for the influence of SI, PEU, PU, and ATT on students' BI.

Table 3 results of multiple regression analysis for the influence of SI, PE, PU, and ATT on students' BI

	R square	Adjusted R square	Standardized coefficient β	F	Sig.	Collinearity statistics Tolerance
SI	0.603	0.589	0.242	43.619	0.001	0.750
PEU			0.210		0.007	0.603
PU			0.221		0.008	0.521
ATT			0.312		0.000	0.548

As indicated in table 3, the social factors have significant influence on students' BI [$F(4,115)= 43.619$, $\beta=0.242$, $p < 0.005$]. The value of R square is 0.603 which indicates that the social influence of students' referent groups explain 60.3% (it's a quiet respectable result) of the variance in students' BI. Therefore, the SI of students' referent groups is a positive predictor to students' intention to learn online.

The result confirms the assumptions of Park (2009), and Shen, Laffey, Lin and Huang (2006) who underlined the SI on students' BI and on their actual behavior within online learning environment as well. This result, also, validate the research model which adapted Davis' original version of TAM to incorporate the influence of social factors to be employed in the area of online learning.

The influence of the social factors on BI could be attributed to the different effects for each category of students' referent groups and their contribution to students' BI. For example: The higher the online instructors actualize their roles in attracting students to learn online, deploying culture of online learning,

building learning community, helping students work in groups, and keeping online discussions to realize productive interaction, the more influence on students' behavior they have. Likewise, students' intentional behavior to use online learning reflects, in several cases, their families' level of support to this kind of learning; families with higher income can afford to buy hardware, software, and can afford the cost of internet access, and therefore they are likely to be supportive for online learning than do families with lower income (Ibrahim, Silong & Samah, 2002).

Similar to the results of Chen, Chen, Lin, and Yeh (2007), the results in table 3 show positive influence of students' PEU on their BI [$F(4,115)=43.619$, $\beta=0.210$, $p < 0.05$]. Based on the value of R square, PEU explains 60.3% of the variance in students' BI.

As for students' PU, the results in table 3 depict positive influence of PU on students' BI to learn online [$F(4,115)=43.619$, $\beta=0.221$, $p < 0.05$]. The value of R square is 0.603 which indicates that PU explains 60.3% of the variance in students' BI. This result is concurrent with the findings of Bertrand and Bouchard (2008). Consequently, in accordance with the results of Li and Huang (2009), the current research suggests the possibility of using both PU and PEU to predict students' BI to use online learning.

Also, the results in table 3 reveal that students' ATT towards online learning have positive influence on their BI to learn online [$F(4,115)=43.619$, $\beta=0.321$, $p < 0.0001$]. The value of R square (0.603) explains 60.3% of variance in students' BI. This result is consistent with the outcomes of Kim, Chun and Song (2009). So, the second hypothesis, "Social influence of students' referent groups, PE, PU, and ATT are positive predictors to students' intention to learn online", was supported.

Based on the values of standardized coefficient β in table 3, each of SI, PEU, PU, and ATT has significant contribution to students' BI. However, students' ATT makes the strongest contribution to students' BI ($\beta=.312$). Therefore, the third hypothesis, "Social influence of students' referent groups is the largest predictor to students' intention to learn online", was rejected.

The assumptions of Ramayah and Ignatius (2005), and Venkatesh and Davis (2000) who dropped the attitudes construct from TAM would be accepted in other contexts rather than online learning.

6.4. The influence of Students' PU and PEU on their ATT

To verify the fourth hypothesis, "students' PU and PEU are positive predictors to their ATT towards online learning", standard multiple regression analysis was conducted. The dependent variable was students' ATT towards online learning, while the independent variables were students' PEU and PU. Table 4 illustrates the results of multiple regressions for the influence of PEU and PU on students' ATT towards online learning.

Table 4 results of multiple regression analysis for the influence of students' PEU and PU on their ATT

	R square	Adjusted R square	Standardized coefficient β	F	Sig.	Collinearity statistics Tolerance
PEU	0.411	0.401	0.217	40.785	0.014	0.662
PU			0.490		0.000	0.662

As depicted in table 4, the value of R square is 0.411 which indicates that students' PEU and PU explain 41.1% (it's a quiet respectable result) of the variance in students' ATT. Therefore, both PEU and PU significantly influence students' ATT towards online leaning [$F(2,117)=40.785$, $p < 0.05$]. So the fourth hypothesis was confirmed. These results emphasized the findings of Masrom (2007), and therefore students' PU and PEU could be used as a predictor for their attitudes towards online learning. However, based on the values of standardized coefficient β in table 4, PU has a stronger effect on students' ATT towards online learning than PEU did. Therefore, students' PU could be used as a strong predictor for their attitudes.

6.5. The influence of students' PEU on their PU

To investigate the influence of students' PEU on their PU of online learning standard multiple regression analysis was also conducted. The dependent variable was PU, whereas the independent

variable was PEU. Table 5 demonstrates the results of multiple regressions for the influence of students' PEU on their PU.

Table 5 Multiple regression results for the influence of students' PEU on their PU

	R square	Adjusted R square	Standardized coefficient β	F	Sig.	Collinearity statistics Tolerance
PEU	0.338	0.332	0.581	60.209	0.000	1.000

As depicted in table 5, the value of R square is 0.338 which indicates that students' PEU explain 33.8% (it's a quiet respectable result) of the variance in students' PU. PEU has a significant influence on PU [$F(1,118) = 60.209, p < 0.0001$]. So, the fifth hypothesis, "Students' PEU is positively influences their PU of online learning", was supported.

Similar to the findings of Masrom (2007), students' PEU was found to influence positively their PU. Consistent with Ramayah, Suki and Ibrahim (2005), the possible explanation to such influence is that the more the student perceives the easiness of online learning, the more he/she perceives its usefulness.

7. Conclusion

The research was conducted to identify the determinants of students' intention to use online learning, to explore the availability of these determinants among students of DBMU, and to investigate relationships and influences of these determinants on students' intention to practice online learning. Based on literature review, SI of students' referent group, PU, PEU, and ATT towards online learning are the variables that were identified as key determinants of students' BI to learn online.

Based on the data that was collected from the research sample, the extent to which these determinants are available among students of DBMU was explored. It was found that students of DBMU tend to have negative attitudes towards using online learning, do not perceive online learning as easy to be used, do not perceive the usefulness of online learning, and they intend not to use online learning.

The reluctance of the students of DBMU to practice online learning could be attributed to insufficient skills that enable them to learn online, and the insufficient support they perceive from instructors, peers and families to adopt this innovation. These reasons may diminish students' perception of ease of use and their positive attitudes towards using online learning, and in turn decline their intention to practice online learning.

Based on the literature review, the research model was developed and employed to explore relationships between these determinants and their influence on students' behavioral intentions to use online learning. Consistent with Masrom (2007), Park (2009), and Ramayah, Suki, and Ibrahim, (2005) the research model excluded the individual actual usage from TAM in addition to replacing the external variables by social influence. The research results illustrate positive and significant relationships between students' behavioral intention to use online learning and each of social influence of students' referent group, students' attitudes towards online learning, and students' perception of both ease of use and usefulness of online learning. Also, the results confirm that each of SI and students' PU, PEU, and their ATT towards online learning influences students' behavioral intention to use online learning. Additionally, SI of students' referent group is found to be a significant predictor for both students' attitudes and their intention to use online learning.

Consistent with the results of Chen, Chen, Lin and Yeh (2007), PU and PEU were found to be significant predictors for students' behavioral intention to use online learning. Likewise, in agreement with the results of Baker-Eveleth and Stone (2008), students' PEU was found to be a positive predictor for both students' ATT and BI to use online learning. Moreover, the results are in accordance with Masrom (2007) in regard to the significant influence of PEU on the PU of the system. On the other hand, the students' ATT towards online learning was found to be a strong predictor for their behavioral intention to use online learning. These findings strongly support the appropriateness of using the research model to understand students' acceptance of online learning in DBMU based their perspectives.

8. Implications for Practice

The research model provides a useful framework for university administration needing to develop the infrastructure of online learning and assess students' readability for online learning. University administration and online should take these factors into consideration when planning to and/or assessing practice of online learning. The results of the research illustrate the importance of social factors related to the students' adoption of online learning. Therefore, deploying the culture of online learning among students community, assessing and developing students' readability to online learning, establishing computer labs equipped with sufficient facilities for online learning and making them available for all students of the university 24 hours /day, supplying students' houses with internet access for free of charge through the server of DBMU, planning and conducting events to deploy culture of online learning among students and their families can facilitate familiarity with online learning and encourage adoption of online learning. Furthermore, organizing training courses to promote students' perception of ease and usefulness of online learning could also enhance their positive attitudes and consequently their behavioral intention to practice online learning.

9. Limitations

Even though this research revealed meaningful findings for the learner related determinants affecting their intention to use online learning, several possible limitations should be mentioned: First, the purposive technique to select the research sample from only a small sector of students of DBMU, Second, the results of the research were based on data that was collected from students who have basic knowledge and insufficient experience of learning online. These limitations may impede the generalization of the findings to all population of DBMU.

10. Further research

It is suggested to replicate the current research using a larger sample, with longer experience to learn online. Additional research to study the influence of each category of students' referent group on their intention to learn online is needed. More research to study determinants related both design issues of online courses and students' behavioral intention to learn online are needed.

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