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University Students' Acceptance of Technology in Math Classes: Does Gender Matter?

[1]Bashar Zogheib, [1]Ahmad Rabaa'I, [2]Salah Zogheib and [1]Ali El Saheli

[1]American University of Kuwait, Slamiya, Kuwait
[2]King Abdul Aziz University, Jeddah, Saudi Arabia
Corresponding Author: **Bashar Zogheib**

Abstract
Although the Acceptance Technology Model (TAM) has been widely used by researchers to test user's acceptance of technology in education and other domains, research in education have underestimated the role played by gender in determining students' acceptance of technology as part of the educational process. This research study is a unique attempt to explore possible gender differences in university students' perceived acceptance of technology in their mathematics classes. It particularly investigates genders' acceptance to use MyMathLab in university math classes. Structural equation modelling with various constructs was used. Results showed that there is no significant difference between genders on perceived usefulness, subjective norm, attitude, and behavioural intention. However, the effect of perceived ease of use on attitude is significantly higher for male students. The findings have great implications for educators and students as they shed light on the significant factors that determine genders' acceptance of technological tools or platforms used in the math classroom.

Keywords: TAM, gender, Math, MyMathLab, university

INTRODUCTION

Higher education institutions have implemented different technologies to provide teachers and students with many interesting tools that can be used to improve the teaching–learning process (Martín-Blas&Serrano-Fernández, 2009).However, despite the strong presences of information and communication technology (ICT) in classrooms all over the world, studies have shown that ICT is underused (Ruthven, 2009).

For instance, although institutions have made large investments in educational technology, many technologies have been under-utilised or abandoned completely, due to limited user acceptance (Liu et al., 2009; Teo, 2009).Similarly, Imtiaz and Mirhashemi (2013, p: 23) argued that many advantages of technology in education have been realized, but there still remain many hindrances and barriers in technology adoption and use in education. The authors stipulated that this has ledto a less than expected implementation of technology in education.
Recently, researchers argued that the models and theories that developed from the body of research within the business contexts could be applied to understanding technology acceptance in educational contexts (Teo, 2013). Among the most popular models in technology acceptance research, the technology acceptance model (TAM) (Davis, 1989) has been found to be a robust and parsimonious model for understanding the factors that affect users' intention to use technology in education (Teo, 2012). In fact, TAM has become one of the most widely used models in technology embedded education research (Kılıç, 2014). What makes the TAM model widespread is its understandability and simplicity (King& He, 2006).

This study proposes and empirically tests an integrated theoretical model of university students' acceptance and intentions to use a technological tool, named MyMathLab, based on an extended version of the technology acceptance model (TAM). The study aims at investigating and assessing the factors that determine the adoption of technological tools in mathematics among university students and explore gender differences in perceptions and relationships among factors affecting these teaching tools acceptance. Structural equation modelling with various constructs was used. Results showed that there is no significant difference between genders on perceived usefulness, subjective norm, attitude, and behavioural intention. However, the effect of perceived ease of use on attitude is significantly higher for male students. This can help practitioners and researchers to better understand how gender influences learners' attitudes towards technological teaching tools, predicting how learners will respond to it, and then utilizing it. It is also believed that the findings of this study will help decision makers in higher education institutions, to gain a better understanding of the factors that determine student's adoption of these tools in classrooms as such leading to a better implementation, investment and benefit in the educational field.

This paper is arranged into six sections. Following the Introduction, the second section provides a brief review of prior studies in technology adoption in general, technology adoption in education, gender differences in technology adoption and the exemplar technological tool used for investigation in this study. The third section discusses the research model and hypotheses. Section four describes the research method. The data analysis is presented in section five, and, finally, section six discusses the findings and concludes the paper.

LITERATURE REVIEW

Technology Acceptance and Adoption

Researchers in the field of Information Systems (IS) have for long been interested in investigating the theories and models that can predict and explain behaviour (Venkateshet al., 2003). Various models were developed, such as the Theory of Reasoned Action (TRA) (Fishbein and Ajzen, 1975), Innovation Diffusion Theory (IDT) Rogers (1962, 1995), Theory of Planned Behaviour (TPB) (Ajzen, 1991), Diffusion of Innovation (DOI) Rogers (1995) and Technology Acceptance Model (TAM) (Davis, 1986). Each model has its own independent and dependent variables for user acceptance and there are some overlaps. However, most of the IT adoption works conducted earlier have adopted the technology acceptance model (TAM) to examine the user's intention for acceptance of technology. In their study of a total of 500 survey questionnaires, Adensina and Ayo (2010) found that TAM is the most widely used model for technology adoption.

TAM was developed by Davis (1986) to theorize the usage behavior of computer technology. TAM was derived from another popular theory called theory of reasoned action (TRA) from the field of social psychology which explains a person's behavior through their intentions. Intentions in turn are determined by two constructs: individual attitudes toward the behavior and social norms, or the belief that specific individuals or a specific group would approve or disprove of the behavior. While TRA was developed to explain general human behavior, TAM specifically explains the determinants of computer acceptance that are general and capable of explaining user behavior across a broad range of end-user computing technologies and the user population (Davis et al., 1989). TAM breaks down the TRA's attitude construct into two constructs: perceived usefulness (PU) and perceived ease of use (EU) to explain computer usage behavior. In fact, TAM specifically explains the determinants of information technology enduser's behavior towards information technology (Saade et al., 2009). In TAM, Davis (1989); it proposes that the influence of external variables on intention is mediated by perceived ease of use (PEU) and perceived usefulness (PU). TAM also suggests that intention is directly related to actual usage behavior (Davis et al., 1989).

While TAM has received extensive support through validations, applications and replications for its power to predict use of IS and is considered to be the most robust and influential model explaining IS adoption behaviour (Davis, 1989; Davis et al., 1989; Lu et al., 2003), it has been found that TAM excludes some important sources of variance and does not consider challenges such as time or money constraints as factors that would prevent an individual from using an information system (Al-Shafi &Weerakkody, 2009). In addition, TAM has failed to provide meaningful information about the user acceptance of a particular technology due to its generality (Mathieson et al., 2001). Davis et al, (1989) compared the TAM with TRA in their study. The confluence of TAM and TRA led to a structure based on only three theoretical constructs: behaviour intention (BI), perceived usefulness (PU) and perceived ease of use (PEOU). Social norms (SN) were found to be weak as an important determinant of behavioural intention. While TRA and TPB theorised social norms as an important determinant of behavioural intention, TAM does not include the social norms as such, influence of social and control factors on behaviour. This is significant, as the model will miss a core and critical component of technology acceptance, since these factors are found to have a significant influence on IT usage behaviour (Mathieson, 1991; Taylor & Todd, 1995) and indeed are important determinants of behaviour in the TPB (Ajzen, 1991).

For instance, researchers have found that original TAM variables may not adequately capture key beliefs that influence consumer attitudes toward e-commerce, for example, (Pavlou, 2003). As a result, TAM has been revised in many studies to fit a particular context of technology being investigated. One important and well-received revision of TAM has been the inclusion of social influence processes in predicting the usage behavior of a new technology by its users (Venktatesh& Davis, 2000). Legris et al. (2003) suggested that TAM deserves to be extended, by integrating additional factors, to facilitate the explanation of more than 40 percent of technology acceptance and usage. Other studies (e.g. Sun & Zhang, 2006; Thompson et al., 2006) have suggested the extension and refinement of the technology acceptance models to enhance it generalizability. Thompson et al. (2006) argued that, considering the evolving new technologies, perceived ease of use and perceived usefulness are not the only suitable constructs that determine technology acceptance. Moreover, Agarwal and Prasad (1998) stated that, including more dimensions, with other IT acceptance models in order to enhance its specificity and explanatory utility, would perform better for a particular context.

Technology Acceptance and Adoption in Education

Recently, various papers have been published on the context of application of TAM in higher education(e.g. Teo, 2009, 2010, 2011a, 2011b). A number of studies have used TAM to examine learners' willingness to accept e-learning systems (e.g., Al-Adwan et al., 2013; Shah et al., 2013; Sharma and Chandel, 2013; Shroff et al., 2011; Tabak and Nguyen, 2013) or to predict learners' intentions to use an online learning community (Liu et al., 2010). Some papers focused on validating TAM on specific software which is applied in higher education. For example, Escobar-Rodriguez and Monge-Lozano (2012) use TAM for explaining or predicting university students' acceptance of Moodle platform, while Hsu et al. (2009) performed an empirical study to analyze the adoption of statistical software among online MBA students in Taiwan. While some studies report that perceived usefulness and perceived ease of use impact attitude toward technology use and behavioral intention to use technology (e.g. Rasimah et al., 2011; Teo, 2011; Sumak et al., 2011), Grandon et al. (2005) argued that e-learning self-efficacy was found to have indirect effect on students' intentions through perceived ease of use. Also, Mungania and Reio (2005) found a significant relationship between dispositional barriers and e-learning self-efficacy. They argued that educational practitioners should take into consideration the learners' dispositions and find ways through which e-learning self-efficacy could be improved.

Dasgupta et al. (2002) analyzed the acceptance of a courseware management technology (e-collaboration tool) by undergraduate students. They found that user level is a significant determinant of the use of this technology. Also, Selim (2003) investigated TAM with web-based learning. The author proposed the course website acceptance model (CWAM) and tested the relationships among perceived usefulness, perceived ease of use and intention to use with university students. The results of his study indicated that the model fits the collected data. Additionally, Selim argued that usefulness and ease of use are significant determinants of the acceptance and use of the course website. By integrating TAM with motivational theory, Lee et al. (2005) studied university students' adoption behavior towards an Internet-based learning medium (ILM) introducing TAM. The authors included perceived enjoyment as an intrinsic motivator in addition to perceived usefulness and perceived ease of use. The results indicated that perceived usefulness and perceived enjoyment had an impact on both students' attitude toward and intention to use ILM. However, perceived ease of use was found to be unrelated to attitude.
Phuangthong and Malisawan (2005) argued that TAM was helpful to understand factors affecting mobile learning adoption with 3rd generation mobile telecommunication (3G) technology. Drennan et al. (2005) examined the factors affecting student satisfaction with flexible online learning and identified two key student attributes of student satisfaction: positive perceptions of technology in terms of ease of access and use of online flexible learning material and autonomous and innovative learning styles. Additionally, Dikbaş et al. (2006) examined the perceptions of teachers in relation to using technology in classrooms. The authors found that perceived ease of use and perceived usefulness are important predictors of effective technology use. Elwood et al. (2006) investigated students' perceptions on laptop initiative in higher education. They found that the external factor "perceived change" is relevant to understand the technology acceptance within the university environment.

Ngai et al. (2007) investigated the factors that influence WebCT use in higher education institutions in Hong Kong using the TAM model. They extended the model to include a new factor, ''technical support". The results revealed that technical support is an important direct factor in the feeling that the system is easy to use and is useful. Moreover, using the extended TAM2, Van Raaij and Schepers (2008) researched the acceptance and usage of a virtual learning environment in China, and the results indicated that perceived usefulness has a direct effect on the use of virtual learning environments (VLE). Perceived ease of use and subjective norms only had an indirect effect via perceived usefulness. It was also demonstrated that new variables related to personality traits, like being innovative and feelings of anxiety towards the computer, had a direct effect on perceived ease of use. Gibson et al. (2008) studied the degree to which TAM was able to adequately explain faculty acceptance of online education. Results indicate that perceived usefulness is a strong indicator of faculty acceptance; however, perceived ease of use offers little additional predictive power beyond that contributed by perceived usefulness of online education technology.

Using UTAUT, Jairak et al. (2009) confirmed that the unified theory of acceptance and use of technology was able to explain university students' mobile learning acceptance. They argued that the university administration should emphasize a well fit design mobile learning system that is appropriate with student's perception. Moreover, Shen and Eder (2009) examined students' intentions to use the virtual world Second Life for education, and investigated factors associated with their intentions. Results suggested that perceived ease of use affects user's intention to adopt Second Life through perceived usefulness. Computer self-efficacy and computer playfulness were also significant antecedents to perceived ease of use of virtual worlds. Based on TAM, Teo (2009) investigated teacher candidates in Singapore. The study found that technology acceptance of teachers increased their effective technology use in their classes. Additionally, Al-hawari and Mouakket (2010) analyzed the significance of TAM factors in the light of some external factors on students' e-retention and the mediating role of e-satisfaction within e-learning context. They found significant relationships between these factors and indicated that further testing across different countries is needed to identify other external factor that might influence IT acceptance. Also, Waheed and Jam (2010) tested the teacher's acceptance of implementing web-based learning environment based on TAM. The results of the study support that teachers are accepting to implement the new virtual based learning system for better productivity of teachers, students and institution.

Sumak et al. (2011) found that perceived usefulness and perceived ease of use were factors that directly affected students' attitude, and perceived usefulness was the strongest and most significant determinant of students' attitude toward using technology in learning, while Wu and Gao (2011) identified perceived enjoyment as a factor in predicting attitude and behavioral intentions to the use of clickers in student learning. Based on TAM, Wong et al. (2012) explored the role of gender and computer teaching efficacy as external variables in technology acceptance in Malaysia. The authors found that TAM was adequately explained by the data. The model accounted for 36.8 percent of the variance in intention to use computers among student teachers.

Gender Differences

In the sociology literature, researchers have indicated that male and female show different behaviour in communication and relationship management (Chan et al., 2015). It is believed that female are relational oriented, while male are agendic (Deaux and Major, 1987); female have shown preferences for maintaining family ties (Di Leonardo, 1987), connecting with friends (Wellman, 1992), and engaging in social activities, whereas male focus more on task-oriented activities (Chan & Cheung, 2015).

From information systems perspective, it is believed that male and female possess different attitudes and preferences in using different systems (Debrand& Johnson, 2008). For instance, there is a considerable interest in the literature in studying the influence of gender on technology acceptance (e.g. Chou, Wu, & Chen, 2011; González-Gómez, Guardiola, Martín-Rodríguez, & Montero-Alonso, 2012; Terzis& Economides, 2011). In fact, IS research has long realized gender differences in a variety of contexts of technology adoption such as information retrieval systems (Venkatesh& Morris, 2000) and communication technologies (Ilie et al., 2005). It is believed that Perceived ease of use tends to be more important for women while perceived usefulness is more important for men(Chan et al., 2015).However, other researchers found some conflicting results. For example, Gefen and Straub's (1997) study shows that females value perceived usefulness more than males, butmales value Perceived ease of use more than females in the context of e-mail use. Similar findings were also found in the context of e-learning (Chinyamurindi&Louw, 2010) and online video sharing (Yang et al., 2010).

Terzis and Economides (2011) study identified the constructs that affected male and female students' behavioral intention to use a computer based assessment. They found that both genders were more likely to use the system if it was playful and its content was clear and relative to the course. Males were motivated by the usefulness of the system, while females were more likely to use the system if it was easy to use. Also, Chou et al. (2011) studied college students' internet-related attitudes and examined whether gender and grade level made any difference in their attitudes. The authors found that male students had a more positive attitude toward the internet-related enjoyment dimension than did female students. Additionally, González-Gómez et al. (2012) analyzed gender differences in e-learning teaching. They observed significant differences between the two genders in terms of their satisfaction with e-learning teaching. Results indicated that female students assigned more importance to teaching methods and planning than male students, as well asto fostering active participation in the learning process.

Venkatesh and Morris (2000) suggested that female users are more risk-averse and show a relatively lower level of initial computer self-efficacy than males. In fact, females typically display lower computer attitude (e.g. Anderson et al., 2008) and feel more anxious about using computers (He & Freeman, 2010). Other research on gender difference however, has shown mixed findings. For example, Popovichet al.(2008) examined computer attitudes among college students. They found that males and females no longer significantly differ in their attitudes toward computers and degree of self-reported computer anxiety.

MyMathLab

One technological tool/platform that can be used in online mathematics classrooms is MyMathLab. MyMathLab is an innovative series of text-specific online courses that is available for Pearson textbooks in mathematics and statistics for college, high school and middle school classes. It provides students with a study plan for each chapter which helps them in organizing their ideas and the concepts they learned in class. It also provides instructors with a tool that minimizes cheating. It assigns problems that are different from one student to another. MyMathLab helps allow students to identify their difficulties and allows for more practice depending on the students' level.It also has a bank of questions that gives the instructor the freedom to choose a variety of questions to create homework, quizzes and tests. The exercises are similar to those in the textbook. However, the homework exercises get regenerated for unlimited time until the students obtain the right answer. Moreover, the exercises are linked to interactive learning resources such as videos or similar examples. This specific option is a powerful source of help for online students. It also has video lectures that provide the student with instructor that is explaining the topics he/she has difficulties with.

MymathLab has a grade book that tracks students' results on tests and homework. However, tests have different settings from homework. Tests follow a multiple choice format. Students are only allowed to answer each question once.

In order for the students to access MyMathLab, they are required to buy a brand new textbook with access code or just buy the access code alone. However, the majority of students prefer buying the book because it just costs a bit more than buying the code alone. Most importantly, MymathLab does not require any training for either students or faculty. Students are usually introduced to MyMathLab in the first period of the semester. The instructor goes over the main important features of it and afterwards it is a simple task for students to access the website and learn more about MymathLab.One drawback of MyMathLab is that students cannot show the steps of their work.

RESEARCH MODEL AND HYPOTHESES DEVELOPMENT

The research model of this study is presented in Figure 1.

Attitude

Karjaluotoet al. (2002) defined attitude as the one's desirability to use the system. Fishbein and Ajzen (1975) classified Attitude into two constructs: attitude toward the object and attitude toward the behavior. The latter refers to a person's evaluation of a specified behavior. In TAM context, attitude is defined as the mediating affective response between usefulness and ease of use beliefs and intentions to use a target system (Suki&Ramayah, 2010). Davis (1989) stated that one's overall attitude toward using a given system is an antecedent to intentions to use. A student behavioural intension can be caused by his/her feelings about the system. If the students do not like the system or if they feel unpleasant when usingit, they will probably want to replace the system with a new one. Many researchers (e.g. Liu et al., 2009; Lee et al.,2005) have demonstrated that attitude is a direct determinant of behavioural intension. Thus, to investigate the effect of students' attitude on their acceptance and usage of *MyMathLab*, this study hypothesizes that:

H1: Attitude has a significant effect on students' behavioural intention to use MyMathLab

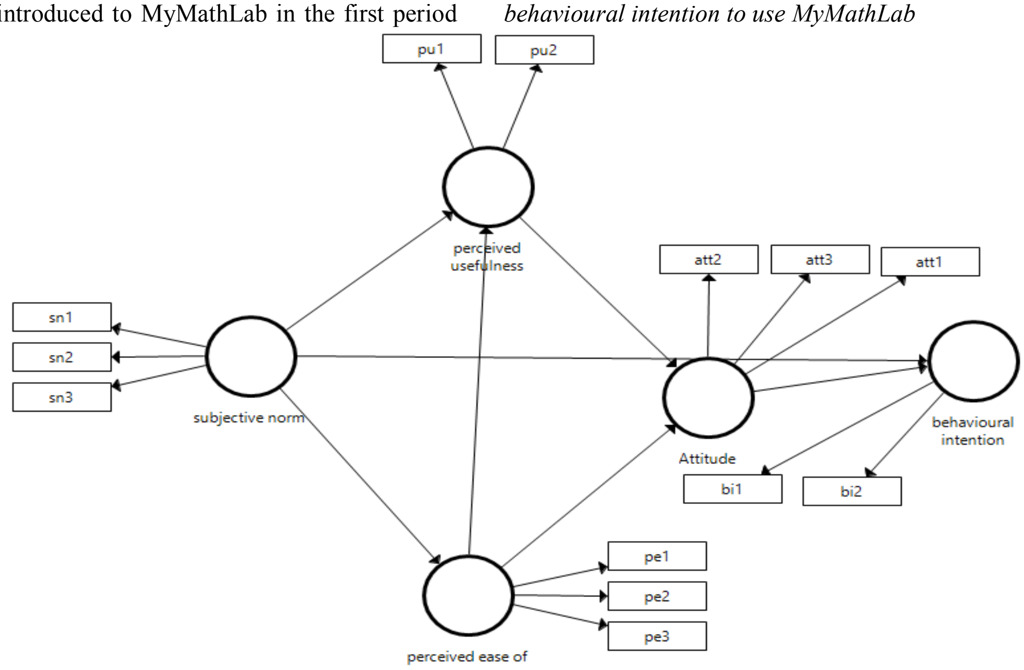

*Figure 1.*The PLS-MGA research model

Perceived Ease of Use

Perceived ease of use is another major determinant of attitude toward use in the TAM model. Davis (1989, p.320) defined Perceived Ease of Use (PEU) as *"the degree to which a person believes that engaging in online transactions would be free of effort"*. PEU is the fundamental determinant for the acceptance and use of IT in general (Moon and Kim, 2001). This finding was later confirmed by other researchers (e.g. Jahangir & Begum, 2008; Hsu, Wang, & Chiu, 2009; Ramayah, Chin, Norazah, &Amlus, 2005) who found PEU to have positively influenced the behavioural intention to use different IS applications. More specifically, perceived ease of use was found to be significant construct in e-learning literature (e.g. Park, 2009; Liu et al., 2005;Selim, 2003; Lee et al., 2005). Additionally, Park (2009), in his study of understanding university students' behavioral intention to use e-learning, found that perceived usefulness and perceived ease of use were related to one another. Other studies have also offered support to the direct influence of perceived ease of use on perceived usefulness (e.g., Teo et al. 2008; Teo2011a). These results suggest the following hypotheses:

H2: Perceived ease of use has a significant effect on students' attitude towards using MyMathLab.

H3: Perceived ease of use has a significant effect on the perceived usefulness of MyMathLab.

Perceived Usefulness

Perceived usefulness is defined as the extent to which a person believes that using a particular system will enhance his or her job performance, Davis (1989). Subramanian (1994) found that perceived usefulness had significant correlation with attitude toward usage behavior. This finding was later confirmed by Fu et al. (2006) and Norazah, et al. (2008) who found that behavioral intention was largely driven by perceived usefulness. There has been extensive body of literature in the IS community that provides evidence of the significant effect of perceived usefulness on usage intention (e.g. Taylor & Todd, 1995; Venkatesh& Davis, 2000). Selim (2003) investigated course website acceptance model (CWAM) and tested the relationships among perceived usefulness, perceived ease of use and intention to use with university students. The authors argued that the model fit the collected data and that the usefulness and ease of use turned out to be good determinants of the acceptance and use of a course website. Also, Liu et al. (2005) concluded that e-learning presentation type and users' intention to use e-learning were related to one another, and concentration and perceived usefulness were considered intermediate variables. Park (2009) found that perceived usefulness and perceived ease of use were found significant in affecting user attitude.Other studies have also provided evidence showing that perceived usefulness has influences on attitudes and intention to use technology (Teo, 2008, 2011a; Yuen, 2002).As a result, this study hypothesizes the following:

H4: Perceived usefulness has a significant effect on attitude towards using MyMathLab.

Subjective Norm (SN)

Subjective norm, one of the social influence variables, refers to the perceived social pressure to perform or not to perform certain behavior (Ajzen, 1991). SN is defined as the person's perception that most people who are important to him or her think he or she should or should not perform the behaviour in question (Davis, 1989). SN was adopted and included in the TAM model, in order to overcome the limitation of TAM in measuring the influence of social environments (Venkatesh and Davis, 2000). Whether this is positive or negative; it is a very important factor in many aspects of the lives of citizens and is likely to be influential (Venkatesh et *al.,* 2003). It is believed that, in some cases, people might use a system to comply with the mandates of others rather than their own feelings and beliefs (Davis, 1989).

From the theory of planned behaviour (Ajzen, 1991) and unified theory of acceptance and use of technology (Venkatesh et al., 2003) subjective norm (or social influence) was hypothesised to have a direct effect on behavioural intention and perceived usefulness. Venkatesh and Davis (2000) argued that when a co-worker thought that the system was useful, a person was likely to have the same idea. It is argued that people can choose to perform a specific behaviour even if they are not positive towards the behaviour or its consequences, depending on how important they think that the important referents believe that they should act in a certain way (Fishbein &Ajzen 1975; Venkatesh & Davis 2000). This was supported by Schepers and Wetzels (2007), who meta-analysed 88 studies on the relationship between subjective norm and the TAM variables. They found overwhelming evidence that showed a significant relationship between subjective norm and perceived usefulness, and subjective norm and intention to use.

In their study, Grandon et al. (2005) found subjective norm to be a significant factor in affecting university students' intention to use e-learning. Findings of many scholars (e.g. Rogers, 1995; Taylor & Todd, 1995; Lu *et al.,* 2003; Pavlou, 2003) suggest that social influence is an important determinant of behaviour. Hence, this study hypothesizes the following:

H5: Subjective norm has a significant effect on intention towards using MyMathLab.
H6: Subjective norm has a significant effect on perceived ease of use of MyMathLab.
H7:Subjective norm has a significant effect on perceived usefulness of using MyMathLab.

METHOD

Study Context and Participants

The sample in this study consisted of 228 university students enrolled in remedial and college algebra classes at a Middle Eastern private American University. The sample is divided into two groups of sizes 62 and 166 for male and female, respectively. The students were enrolled in the spring semester of 2015 in four different sections, two remedial and two college algebra classes that were taught by two different instructors. The difference in the sample sizes is due to the fact that the number of female students is more than the number of male students in the considered university. The participants were admitted to the university based on their high school GPA. Students were pursuing different fields of study, for example, graphic design, communication, business, computer science, engineering, and some were undecided. Participants had to take remedial math as a preparatory course which is a not for credit class. On the other hand, college algebra is a three credit class that is a general requirement course. It is one of two math classes that non science major students should take. Although it is counted in the GPA of the computer sciences and engineering students, it is not counted as one of the math required courses. All students had to use MyMathLab which is an innovative series of text-specific online courses that is available for Pearson textbooks in mathematics and statistics. Students were assigned the homework through MyMathLab and had the option to access the homework more than once. MyMathLab walked them through the problems step by step until they reached a correct final solution.

Data were collected during the last week of classes to guarantee that students had obtained enough experience with the system before they answer the questionnaire questions.

Measures

The instrument used in this study uses a modified version of the original technology acceptance model (TAM) that was created by Davis(1989) as shown in Figure 2. Park (2009) has used TAM with seven constructs; self-efficacy, subjective norm, system accessibility, perceived usefulness, perceived ease of use, attitude, and intention to use. In this study, the combination of TAM and subjective norm is used. The subjective norm indicators were "What my MathLab stands for is important for me as a university student," "I like using MyMathLab on the similarity of my values and society values underlying its use," "In order to prepare me for future job, it is necessary to take MyMathLab courses."The behavioural intention indicators were "I intend to check announcements from MyMathLab frequently," "I intend to be a heavy user of MyMathLab." The attitude construct were "studying through MyMalthLab was a good idea," "studying through MyMalthLab was a wise idea," and "I am positive toward MyMathLab". The perceived usefulness indicators were "MyMathLab would improve my learning performance," and "MyMathLab could make it easier to study course content." The perceived ease of use indicators were "I find MyMathLab system easy to use," "Learning how to use MyMathLab is easy for me," and "It is easy to become skilful at using MyMathLab."

DATA ANALYSIS

The statistical software Smart-PLS 3.1 that implements the use of partial least square structural equation modelling (PLS-SEM) method was used to conduct the statistical analysis in this study. (PLS-SEM) is a variance based method used to estimate structural equation models. Other well-known softwares such as LISREL and AMOS are covariance based that use the maximum likelihood approach to estimate structural equation models. The advantage of using PLS-SEM lies in the fact that no assumption on the distribution of data is needed (Cassel, Hackyl, and Westlund, 1999). Moreover, a sample size that is 10 times the largest number of indicators is required. The two groups in this study have sizes of 62 ad 166 for male and female, respectively. Each sample size is more than what is required because the largest number of indicators is three. The large sample sizes will increase the consistency of the model estimations. The indicators in the proposed model are all reflective because they are considered as effects of the latent variables (Bollen and Lennox, 1991).

Tables 1, 2, 3 & 4 provide the information on student gender, student age, student years of study and student marital status, respectively.

Table 1
Student gender

	Frequency	Percent
Male	62	27.2
Female	166	72.8
Total	228	100

Table 2
Student age

	Frequency	Percent
Less than 18	17	7.5
18-25	195	85.5
26-30	7	3.1
More than 30	9	3.9
Total	228	100

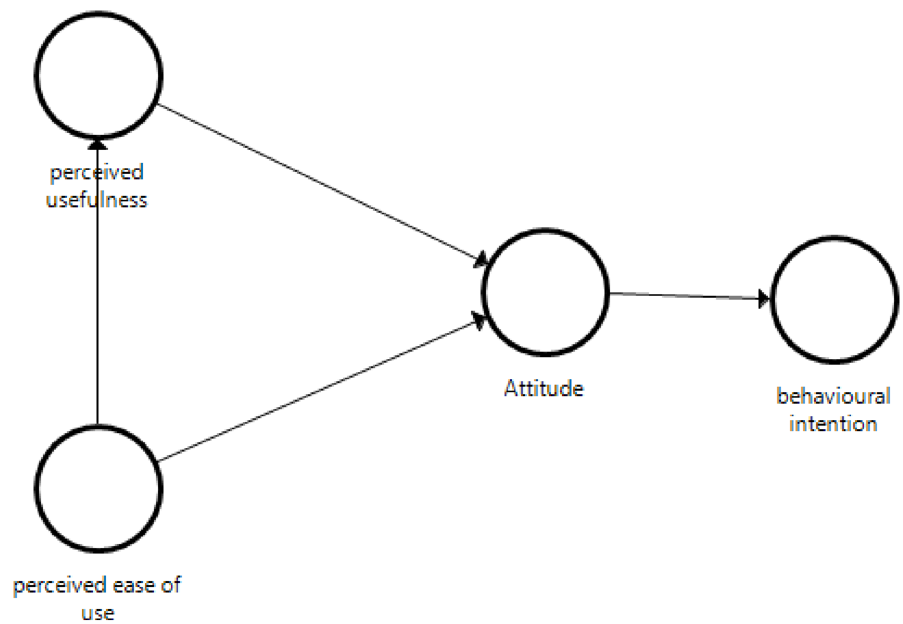

Figure 2. Original TAM (Davis, 1989)

Table 3
Student years of study

	Frequency	Percent
one year	125	54.8
Two years	66	28.9
Three years	21	9.2
Four years	16	7.1
Total	228	100

Table 4
Student marital status

	Frequency	Percent
Single	207	90.8
Married	21	9.2
Total	228	100

In order to assess the measurement model, the composite reliability, convergent validity and discriminant validity should be evaluated (Barclay et al., 1995).The composite reliability estimates the reliability based on the inter correlations of the indicator variables of a specific construct. It is recommended that the value does not exceed 0.95. Otherwise, the indicators will be measuring same information (Nunally and Bernstein, 1994).Construct reliability for all constructs in the female model ranged between 0.902 and 0.951and for the male model they ranged between 0.910 and 0.954 as shown in Table 5. Convergent validity measures the positive correlation between an indicator and the other indicators of a construct. It can be measured by using the average value extracted measure (AVE) that should exceed 0.5.Table 6 shows that all values in the female model varied between 0.754 and 0.902 and for the male model they ranged between 0.771 and 0.911.Discriminant validity measures the extent to which a latent variable is distinct from other variables. One way to assess discriminant validity is by using the Fornell-Larcker criterion (Fornell&Larcker, 1981). It requires that the square root of each construct's (AVE) be higher than all its correlation with the other constructs. Tables7& 8 for female and male models respectively, show that all diagonal values (square root of AVE) are higher than those in their corresponding rows and columns.

The results of the hypothesis testing for both models are shown in Table 9. Chin (1998) recommended that Bootstrapping of 500 subsamples is to be conducted to test the significant of the t test. Seven hypotheses were tested in each of the two models and it was found that for both model, a few hypotheses were significant at the 0.05 and 0.1 significance level while the majority were significant at the 0.000 significance level. Table 9 shows the path coefficients and the p-values.

Figure 4 provides the values of the outer loadings of the male model. All values lie above the threshold value of 0.708. They vary from 0.826 to 0.962.It also shows the squared multiple correlation R^2 for all endogenous variables. The SEM explained substantial variance in attitude$R^2 = 0.694$, in perceived usefulness$R^2 = 0.410$, in perceived ease of use $R^2 = 0.269$ and in behavioural intention$R^2 = 0.430$.

Table 5: *Composite Reliability*

	Female Model	Male Model
attitude (ATT)	0.948	0.944
behavioral intention (BI)	0.928	0.910
perceived ease of use (PE)	0.951	0.931
perceived usefulness (PU)	0.948	0.954
subjective norm (SN)	0.902	0.910

Table 6: *Average Value Extracted*

	Female Model	Male Model
attitude (ATT)	0.858	0.849
behavioral intention (BI)	0.865	0.835
perceived ease of use (PE)	0.867	0.817
perceived usefulness (PU)	0.902	0.911
subjective norm (SN)	0.754	0.771

Table 7: *Latent Variable Correlation for the female model*

	ATT	BI	PE	PU	SN
ATT	**0.927**				
BI	0.506	**0.93**			
PE	0.784	0.444	**0.931**		
PU	0.831	0.47	0.745	**0.949**	
SN	0.674	0.598	0.636	0.681	**0.869**

Table 8: *Latent Variable Correlation for the male model*

	ATT	BI	PE	PU	SN
ATT	**0.921**				
BI	0.554	**0.914**			
PE	0.555	0.401	**0.904**		
PU	0.824	0.364	0.545	**0.955**	
SN	0.707	0.648	0.517	0.569	**0.878**

Figure 5 provides the values of the outer loadings of the female model. All values lie above the threshold value of 0.708. They vary from 0.771 to 0.951.It also shows the squared multiple correlation R^2 for all endogenous variables. The SEM explained substantial variance in attitude $R^2 = 0.752$, in perceived usefulness $R^2 = 0.628$, in perceived ease of use $R^2 = 0.404$ and in behavioural intention $R^2 = 0.377$.

Table 9: *Hypotheses testing results*

	Female Model		Male Model	
	Models' coefficients	P Values	Models' coefficients	P Values
H1: ATT -> BI	0.189	0.023	0.192	0.089
H2: PE -> ATT	0.370	0.000	0.149	0.087
H3: PE -> PU	0.525	0.000	0.343	0.012
H4: PU -> ATT	0.555	0.000	0.743	0.000
H5: SN ->BI	0.470	0.000	0.512	0.000
H6: SN -> PE	0.636	0.000	0.518	0.000
H7: SN -> PU	0.347	0.000	0.392	0.000

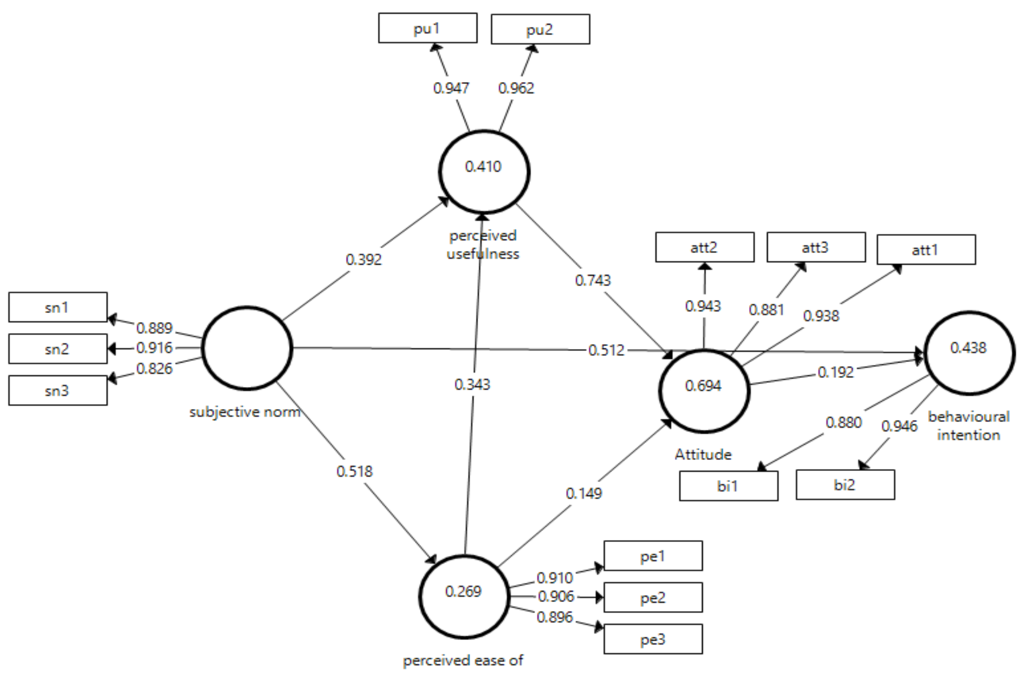

*Figure 4.*The PLSoutput for the male model

In this study, the path coefficients for the PLS path models of the two groups are calculated to see whether there is a significant difference between female and male. A non-parametric multi-group analysis (PLS-MGA) method that was proposed by

Henseler et al., (2009) is conducted to test the hypotheses that the path coefficients are not significantly different for the ten relationships in the model. Table 10 shows the results for the path coefficients absolute difference and for the p-values. A difference is significant at the 0.05 level of error, if the p-value is smaller than 0.05 or larger than 0.95 as recommended by Henseler et al., (2009). As seen from Table 10, only one path coefficient differ significantly across the male and female groups, at the 0.05 significant level. The effect of perceived ease of use on attitude is significantly higher for the male group.

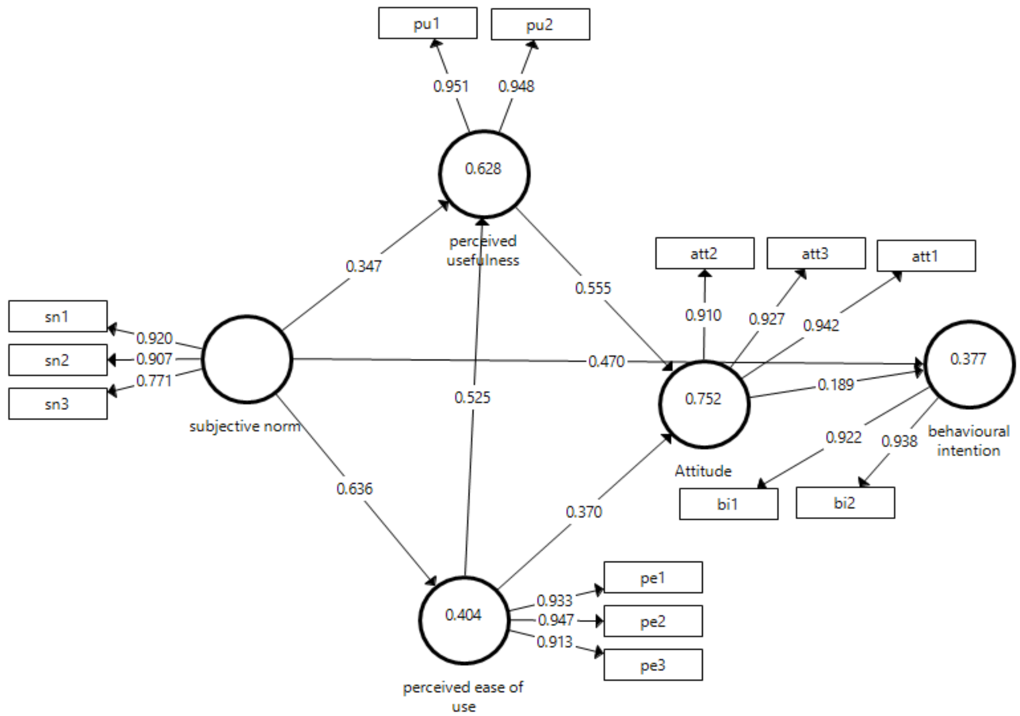

*Figure 5.*The PLS output for the female model

Table 10: *PLS-Multi-group Analysis(PLS-MGA)*

	Path coefficient difference (|female-male|)	P Values (female versus male)
H1: ATT -> BI	0.002	0.517
H2: PE -> ATT	0.221	0.047
H3: PE -> PU	0.182	0.132
H4: PU -> ATT	0.187	0.938
H5: SN ->BI	0.042	0.612
H6: SN -> PE	0.118	0.116
H7: SN -> PU	0.044	0.634

DISCUSSION AND CONCLUSION

This work tested University students' acceptance of MyMathLab using TAM. Results revealed that subjective norm have a positive effect on female and male students' perceived ease of use and perceived usefulness. Subjective norm also directly affects behavioural intention. Perceived ease of use affects perceived usefulness and attitude, perceived ease of use affects attitude and attitude affects behavioural intention. The reported results are in line with what is found in literature and can be explained based on the motivational theory (Yi and Hwang, 2003; Lee, Cheung, & Cheng, 2005; Sadde, Nebebe, & Tan, 2007; Park, 2009). Although the composite reliability values for some of the constructs is close to 0.95, this is still considered acceptable. High values have been reported in the literature. For example (Yi & Hwang, 2003) reported values of0.94 and 0.93 for the two constructs ease of use and enjoyment, respectively. Park (2009) reported a value of 0.93 and 0.94 for perceived ease of use and attitude, respectively. The reason for such high values could be that participants could not fully differentiate between the indicators of the considered construct. This issue could be solved in a future work by probably rephrasing the questions.

The main result of interest in this study is that there is no significant difference between genders on perceived usefulness, subjective norm and behavioural intention. This suggests that, male and female students in math classes have same views about the usefulness of technology in learning, have similar attitude about using technology in math, and have similar intentions of using technology in education. On the other hand, the effect of perceived ease of use on attitude is significantly higher for male students than female students. This suggests that, male students feel more comfortable than female students in using technology in education. Perceived ease of use is defined as "*the degree to which a person believes that engaging in online transactions* *would be free of effort*." For students, this means student's perceived ability to handle technological applications in their math classes. The reported results that female students find it more challenging to use MyMathLab than their male counterparts were in line with some previous findings in the literature (Houtz& Gupta, 2001; Teo et al., 2015).

Such findings require some effort on part of educators and curriculum planners to take into consideration this gender difference between male and female students. In particular, finding of this research should encourage institutions to put more emphasis on implementing more technological tools in the learning process of mathematics. In general, the empirical results supported the model specially, for female students. Probably, students welcomed the adoption of MyMathLab as a part and tool of the learning process. Perceived usefulness as defined by Davis (1989) is the extent to which a person believes that using a particular system will enhance the job. The high effect of the perceived usefulness construct on attitude for both groups can be explained by students' interest in MyMathLab and viewing it as useful technological tool that might enhance their learning. It seems that students are motivated both intrinsically and extrinsically as they seem to value the role that technological tools will play either on the personal level or on the social level. It is not only beneficial to them as students, but it will also please others, such as parents and teachers, to know that such tools had a big influence on their education.
Last but not least, this research study examined the applicability of an extended version of TAM to explain genders' acceptance of the platform MyMathLab as part of their enrolment in mathematics classes at university. It was a unique attempt in the field of education that explores possible gender differences in university students' perceived acceptance of technology. The findings have great implications for educators and students all over the world as they shed light on the significant factors that determine genders' acceptance of technological tools or platforms used in the math classroom.

Despite the great findings of this study, it is essential to remember that it was limited to students in a private American university in the Middle East. It is recommended that same study be done at different institutions in the region, public and private, before any generalization can be made. It is recommended that this study be extended to other demographic characteristics, for example, age, location, etc... It would also be interesting to test a variety of platforms other than MyMathLab. The number of female students in this study was higher than that of male students; this might affect the power of the statistical tests conducted. For this reason, it is recommended that in any future work data in both groups be close to each other.

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