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Computer based assessment: Gender differences in perceptions and acceptance

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ABSTRACT

This study identifies the constructs that affect male and female students' behavioural intention to use a computer based assessment (CBA). It extends the Computer Based Assessment Acceptance Model (CBAAM) (Terzis & Economides, 2011) by taking into consideration the genders. An appropriate survey questionnaire was completed by 56 male and 117 female students. Results indicate that both genders are more likely to use the CBA if it is playful and its content is clear and relative to the course. Men are also motivated by their perceptions regarding how much useful the CBA is. Also, their attitude towards the CBA is influenced by their social environment. On the other side, women are more likely to use the CBA if it is easy to use and stimulates their efforts for better final exam preparation. The CBAAM incorporating genders explains approximately 50% of the variance of behavioural intention for each gender. These findings are useful for researchers and practitioners in order to understand better the different constructs that affect each gender regarding the acceptance of a CBA system.

1. Introduction

Gender differences have been examined in various studies regarding the factors that influence e-learning acceptance (e.g. Gefen & Straub, 1997; Ong & Lai, 2006; Wang, Wu, & Wang, 2009). Previous research regarding gender differences in perceptions and acceptance of e-learning systems found mixed results. Some studies toward e-learning usage in different context such as universities, schools and organizations found that males had significantly higher positive perceptions regarding e-learning than females (e.g. Enoch & Soker, 2006; Hoskins & Van Hooff, 2005; Koohang, 2004; Ong & Lai, 2006; Zhou & Xu, 2007). Other studies showed no gender gap regarding perceptions (e.g. Davis & Davis, 2007; Zhang, 2005). Further studies join on these contradictory findings regarding the gender moderate effect on the variables that affect technology acceptance. A number of studies found that men are more motivated by Perceived Usefulness on behaviour intention (Gefen & Straub, 1997; Sun & Zhang, 2006; Venkatesh & Morris, 2000) while women are more influenced by Perceived Ease of Use (Ong & Lai, 2006). However, other studies indicated exact the opposite or no differences between the two genders (Cheung, Lee, & Chen, 2002; Yuen & Ma, 2002). Mixed results are also found regarding other variables such as social influence, computer self efficacy and computer anxiety (e.g. Kesici, Sahin, & Akturk, 2009; Wang et al., 2009).

The current study was triggered by previous findings and attempts to highlight potential gender differences in perceptions and acceptance regarding computer based assessment (CBA).

CBA, as part of e-learning or as a separate entity, helps students to evaluate their strengths and weaknesses (Joosten-ten Brinke et al., 2007; Kaklauskas et al., 2010). There are various educational practices such as: Essays, reports, projects, presentations, dissertations and even exams, in which self assessment can be used. Recently, computer based assessment technologies have been developed in order to automate the assessment process (Charman & Elmes, 1998; Economides & Roupas, 2007; Fluck, Pullen, & Harper, 2009; Gvozdenko & Chambers, 2007). CBA offers opportunities for innovations in testing and assessment (e.g. Bennett, 1998; Chatzopoulou & Economides, 2010; Scalise & Gifford, 2006) and it can be used in many different fields. Formative and summative assessments are the two major categories of CBA. Summative assessments help students to evaluate their effectiveness in learning. On the other hand, formative assessments help students in reaching their targets through appropriate feedbacks (Birenbaum, 1996; Turner & Gibbs, 2010).

Furthermore, CBA offers many advantages to the academics and practitioners. The major advantages are: Time reduction, test security, speed of results, cost, automatic record keeping for item analysis and distance learning (Bugbee, 1996; Drasgow & Olsen-Buchanan, 1999; Gvozdenko & Chambers, 2007; Mazzeo & Harvey, 1988; Mead & Drasgow, 1993; Parshall, Spray, Kalohn, & Davey, 2002; Smith & Caputi, 2005; Thelwall, 2000; Tseng, Macleod, & Wright, 1997).

As CBA is increasingly being used in the educational practice, the issue of CBA acceptance has arisen. Terzis and Economides (2011) developed the Computer Based Assessment Acceptance

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Model (CBAAM) which uses variables from previous known models and introduces two new variables. It adopts the following variables from the corresponding models: (1) Perceived Ease of Use (PEOU) and Perceived Usefulness (PU) from the Technology Acceptance Model (TAM) (Davis, 1989); (2) Social Influence (SI) and Facilitating Conditions (FC) from the Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh, Morris, Davis, & Davis, 2003); (3) Perceived Playfulness (PP) from an extended TAM version (Moon & Kim, 2001); (4) Computer Self Efficacy (CSE) from Compeau and Higgins (1995). Also, in order to explain the intention to use a CBA, the CBAAM proposes two new variables: Content (C) and Goal Expectancy (GE) (Terzis & Economides, 2011). An extended analysis of each variable takes place in Section 3 which describes the research model and hypotheses of this study.

This study uses the CBAAM and extends it in an attempt to find out the gender effect among the variables toward CBA acceptance.

Particularly, this paper investigates firstly the differences between genders perceptions concerning the nine variables of CBAAM and secondly the gender differences regarding which factors affect the students' acceptance and intention to use or to participate in a voluntary CBA. Although, there are previous studies regarding gender differences on acceptance of learning management systems (LMS) (e.g. Wang et al., 2009) there was not any previous study on acceptance of CBA. The next section describes the most related previous studies. The third section demonstrates the methodology and the fourth section shows the results. A discussion section analyses the results. Finally, the conclusions, limitations and future research are presented.

2. Literature review

In this section, we present previous studies that are important for the development of the CBAAM and for the purposes of this study. Previous studies are separated in three categories. In the first category, we show all the important models that have been used in technology acceptance such as TAM and UTUAT (Table 1). In the second category, we display the constructs and their relationships that have been used in e-learning acceptance based on the technology acceptance literature (Table 2) and other important variables that were firstly introduced in the e-learning acceptance context. Finally, in the third category we present studies that incorporated the effect of gender on variables and their relationships regarding technology and e-learning acceptance.

2.1. Information technology acceptance

Previous studies on information technology (IT) acceptance have introduced twelve basic models (Table 1). These models have proposed various determinants of IT acceptance and especially usage behaviour.

2.2. E-learning acceptance

Various studies on computerized learning systems acceptance have been based on the above basic models. These studies have used previous constructs from the basic models in their proposed models regarding Learning Management Systems (LMS) acceptance (Table 2):

However, e-learners have additional motives requiring a search for additional intrinsic motivation factors (Ong, Lai, & Wang, 2004).

Some other studies developed variables more relevant to e-learning. The constructs of Perceived Enjoyment, Learning Goal Orientation and Application Specific Self Efficacy were proposed by Yi and Hwang (2003). Enjoyment explains that using a computer system is perceived to be personally enjoyable in its own right aside from the instrumental value of the technology (Davis, Bagozzi, & Warshaw, 1992). Learning Goal Orientation was defined as the individual's approach to a task in order to understand something new or to enhance his/her level of competence (Yi & Hwang, 2003). Playfulness (Moon & Kim, 2001) and self-management of learning which is defined as the self-discipline and the ability in autonomous learning (Smith, Murphy, & Mahoney, 2003) was added to explain e-learning acceptance (Wang et al., 2009). Another construct in the domain of information technology (IT) is Personal Innovativeness (Van Raaij & Schepers, 2008). It is defined as the willingness of an individual to try out any new information technology (Agarwal & Prasad, 1999). Furthermore, Personal Outcome Expectations and Perceived Behavioural Control were used in LMS acceptance. Personal Outcome Expectations is the outcome expectancy estimated by an individual regarding whether a particular behaviour will result in requisite outcomes (Bandura, 1977; Shih, 2008); and Perceived Behavioural Control is the individual perceptions of his/her control over the Web-based system for learning (Shih, 2008). Other researchers used the learner's satisfaction as the dependent variable (e.g. Sun, Tsai, Finger, Chen, & Yeh, 2008; Wang, 2003).

A different approach regarding e-learning adoption based on three key factors (individual, system and organisational) was also

Table 1
Previous IT acceptance models.

Model	Major constructs	Support evidence
Theory of Reasoned Action (TRA)	Attitudes, subjective norms	Fishbein and Ajzen (1975)
Technology Acceptance Model (TAM)	Perceived Usefulness, Perceived Ease of Use	Davis (1989)
Motivational Model (MM)	Extrinsic Motivation, Intrinsic Motivation	Davis et al. (1992)
Social Cognitive Theory (SCT)	Personal Factors (cognitive, affective, biological), Behaviour factors, Environmental factors	Bandura (1986) and Compeau and Higgins (1995)
Theory of Planned Behaviour (TPB)	Perceived Behavioural Control	Ajzen (1991)
Innovation Diffusion Theory (IDT)	Relative Advantage, Ease of Use, Image, Compatibility, Results Demonstrability	Moore and Benbasat (1991) and Rogers (2003)
The Model of PC utilisation (MPCU)	Complexity of PC use, Job Fit With PC Use, Long-Term Consequences of PC Use, Affect Toward PC Use, Social Factors Influencing PC Use, Facilitating Conditions for PC Use	Thompson et al. (1991) and Triandis (1977)
Combined TAM and TPB (C-TAM-TPB)	Perceived Usefulness, Perceived Ease of Use, Perceived Behavioural Control	Taylor and Todd (1995)
Task Technology Fit model (TTF)	Task Requirements, Tool Functionality, Individual Performance	Goodhue and Thompson (1995)
Integrated TAM/TTF model	TAM + TTF constructs	Dishaw and Strong (1999)
TAM2	TAM + Subjective Norm	Venkatesh and Davis (2000)
Unified Theory of Acceptance and Use of Technology (UTAUT)	Performance Expectancy, Effort Expectancy, Social Influence, Facilitating Conditions, Gender, Age, Experience, Voluntariness	Venkatesh, Morris, Davis, and Davis (2003)

Table 2
Studies that used constructs from IT acceptance to LMS acceptance.

Construct	Related causal links	Support evidence
Perceived Usefulness	PU → Intention to Use	Ong et al. (2004), Padilla-Melendez et al. (2008), Ong and Lai (2006), Landry, Griffeth, and Hartman (2006), Teo (2009), Yi and Hwang (2003), Van Raaij and Schepers (2008) and Lee (2008)
	PU → Attitude	Ngai, Poon, and Chan (2007)
Perceived Ease of Use	PEOU → Intention to Use	Ong et al. (2004), Padilla-Melendez et al. (2008), Ong and Lai (2006), Landry, Griffeth, and Hartman (2006), Teo (2009), Yi and Hwang (2003), Van Raaij and Schepers (2008), Liao and Lu (2008) and Lee (2008)
	PEOU → Attitude	Ngai, Poon, and Chan (2007)
Social Influence	SI → Intention to Use	Wang et al. (2009), Van Raaij and Schepers (2008)
Computer Self-Efficacy	CSE → Intention to Use	Padilla-Melendez et al. (2008)
	CSE → PU, PEOU	Ong et al. (2004), Ong and Lai (2006) and Teo (2009)
Facilitating Conditions	FC → Attitude	Teo (2009) and Teo, Lee, and Chai (2008)

proposed (Nanaykkara, 2007). Another study used the following six dimensions to assess the adoption's factors: student dimension, instructor dimension, course dimension, technology dimension, design dimension, and environment dimension (Sun et al., 2008).

2.3. Gender perceptions and effects on IT and e-learning acceptance

Researchers and tutors have realized that there are differences between men and women regarding their perceptions and effects on the relationships among the constructs that affect the behavioural intention to use computers and e-learning. However, the literature did not provide conclusive results. Even if the gender gap regarding the perceptions towards computers and e-learning usage seems to be eliminated, it is not conclusive that there are not gender differences regarding the moderate effect of gender on the relationships between the variables that are important for behavioural intention and acceptance.

Concerning perceptions and attitudes, earlier studies showed that male students were more positive towards computer use in a learning context. For example, males had more positive perceptions than females towards the use of a digital library (Koohang, 2004) and towards the use of web based instruction at an open university (Enoch & Soker, 2006). Moreover, Tondeur, Valcke, and van Braak (2008) found that male teachers used computers more often for teaching purposes than females.

However, some recent studies did not found any significant difference between genders' perceptions towards e-learning use (e.g. Cuadrado-García, Ruiz-Molina, & Montoro-Pons, 2010; Hung, Chou, Chen, & Own, 2010).

This trend is substantiated by other studies focused on relative variables towards computer use such as computer anxiety, computer self efficacy and computer attitude. Specifically, earlier studies regarding computer anxiety (Chou, 2003; Tsai, Lin, & Tsai, 2001), computer self efficacy (Durndell & Thomson, 1997; Schaumburg, 2004) and computer attitude (Liaw, 2002) supported that males were thought to be more positive towards computers than females. However, other studies supported that there are not significant differences between males and females regarding computer anxiety, computer self efficacy and computer attitude (e.g. Holcomb, King, & Brown, 2004; Imhof, Vollmeyer, & Beierlein, 2007; Kesici et al., 2009; Li & Kirkup, 2007; Popovich, Gullekson, Morris, & Morse, 2008).

On the other hand, previous studies regarding gender effects on the relationships among important variables towards intention to use computers or e-learning indicated some differences between males and females users. For example, earlier studies based on TAM observed that males demonstrate a higher relationship between Perceived Usefulness and behavioural intention than females (Gefen & Straub, 1997; Venkatesh & Morris, 2000). Moreover, UTUAT suggested gender as a moderating factor in relationships between performance expectancy, effort expectancy, social influence, facilitating conditions and behavioural intention (Venkatesh et al., 2003). Based on these existing findings, other studies specialized to e-learning acceptance found similar results. For example, concerning the utilisation of university library website resources, Kim (2010) suggested that female users are more likely to use the service if it is easy to utilize, while male users are more likely to use the service if they perceive that is useful. Moreover, Ong and Lai (2006) suggested the same results regarding the relationships among dominants of e-learning acceptance in an organizational context. Furthermore, Wang et al. (2009) indicated that gender differences moderate the effects of social influence and self-management of learning on m-learning intention to use.

However, studies implemented outside of the western culture did not support the prior findings. Particularly, Dong and Zhang (2011) indicated that Chinese women were higher influenced by their computer attitudes while Chinese men were higher affected by their subject norms. Moreover, Umrani and Ghadially (2008) found that the females' behavioural intention to use computers was defined by Perceived Usefulness and subjective norm, while the TAM factors were not significant for males. Recently, the role of gender in moderating the relationships of family support, Internet self-efficacy and the effects of e-learning were investigated (Chu, 2010).

Gender effects were also measured in different contexts besides e-learning. Wang and Wang (2008) developed an acceptance model to demonstrate gender differences regarding on-line gaming. Gender moderations on use of communication technologies were also investigated (Ilie, Van Slyke, Green, & Lou, 2005).

2.4. Computer Based Assessment Acceptance Model (CBAAM)

The CBAAM has been proposed regarding the acceptance of a CBA (Terzis & Economides, 2011). It uses eight constructs in order to define behavioural intention to use a CBA. These eight constructs are the following: Perceived Playfulness (PP), Perceived Usefulness (PU), Perceived Ease of Use (PEOU), Computer Self Efficacy (CSE), Social Influence (SI), Facilitating Conditions (FC), Goal Expectancy (GE) and Content (C) (Fig. 1). CBAAM proves that behavioural intention (BI) to Use a CBA is significantly attributed to Perceived Playfulness and Perceived Ease of Use. Perceived Usefulness is significantly explained by Goal Expectancy, Content, Social Influence and Perceived Ease of Use. Perceived Playfulness is defined by Usefulness, Content, Ease of Use and Goal Expectancy. Furthermore, Computer Self Efficacy and Facilitating Conditions define Perceived Ease of Use (Fig. 1).

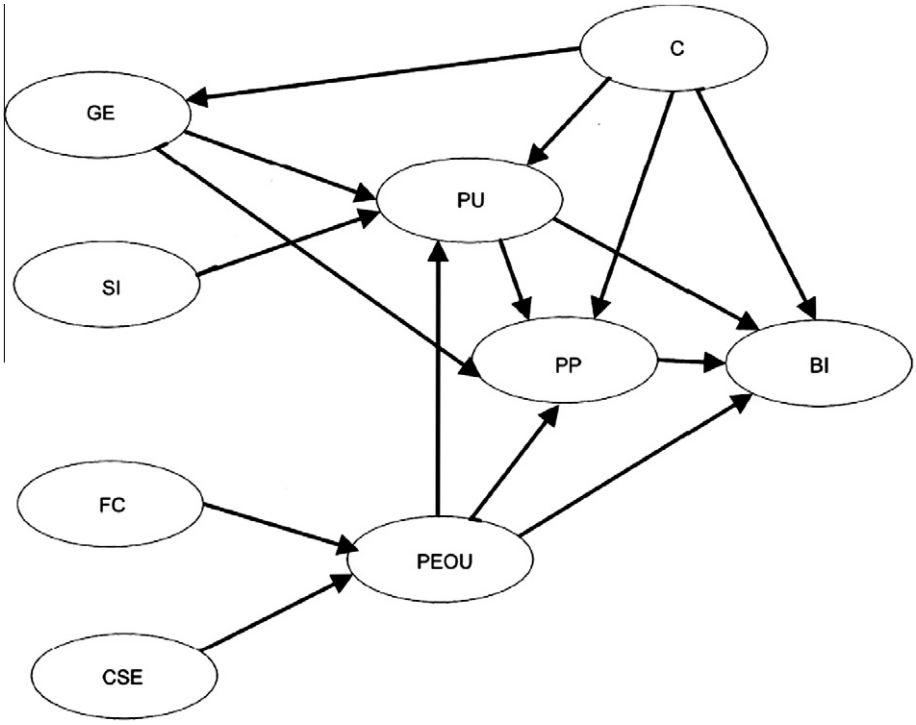

Fig. 1. Computer Based Assessment Acceptance Model (CBAAM) (Terzis & Economides, 2011).

The main research aim of the current paper is to explore gender differences in perceptions and relationships among dominants affecting computer based assessment acceptance, based on the CBAAM and other previous studies (Fig. 2). Particularly, we attempt to highlight potential differences between genders regarding their perceptions for each one of the nine constructs of the CBAAM. The CBAAM has 15 causal relationships between the constructs. We also investigate the moderate effect of gender on these relationships in order to indicate which constructs are more important for each gender's Behavioural Intention to use CBA.

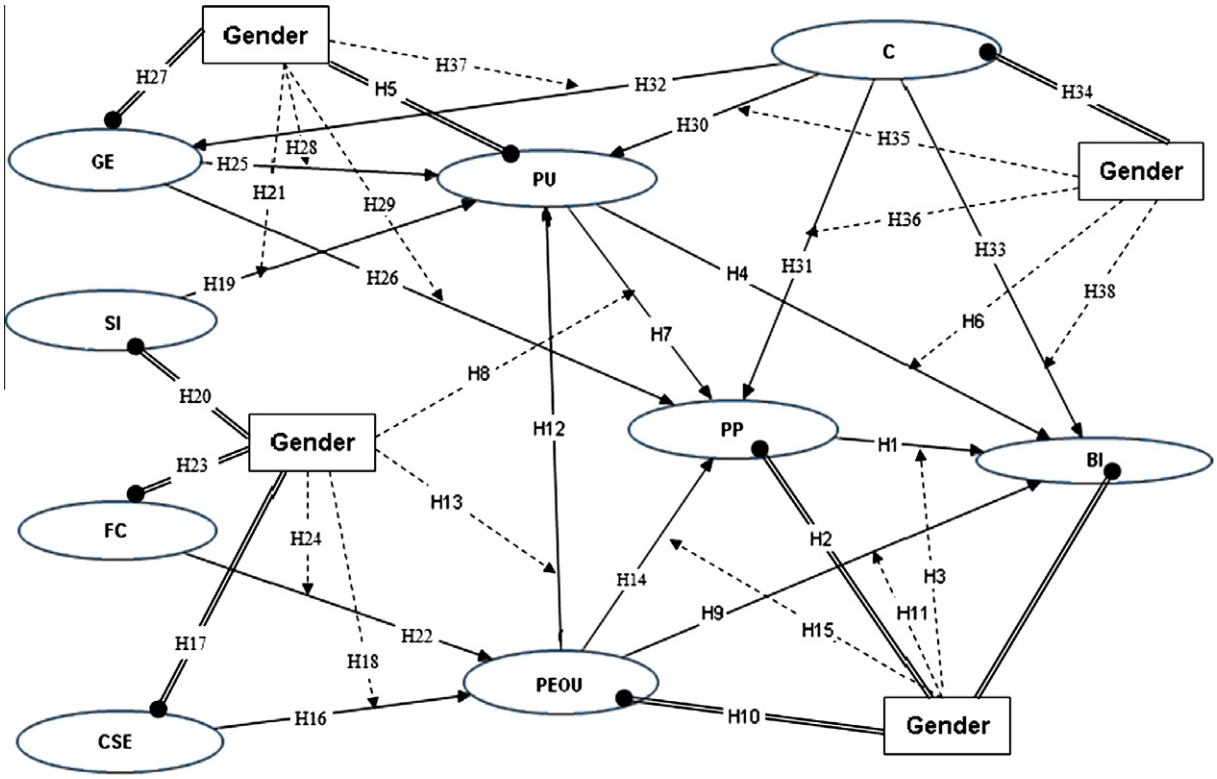

Fig. 2. Research model.

Thus, practitioners, researchers and tutors will understand better how gender influences learners' attitudes towards CBA, which factors are affecting the CBA's use, and why each gender will use it. In the third section, we present a detailed analysis of each construct and our hypotheses based on the previous work.

3. Research model and hypotheses

3.1. Perceived playfulness

Moon and Kim (2001) based on the studies of Csikszentmihalyi (1975) and Deci and Ryan (1985) introduced the Perceived Playfulness construct in TAM. They found that Perceived Playfulness has a significant positive effect on behavioural intention to use the Web. Perceived Playfulness (PP) is defined by three dimensions:

(a) Concentration: If the user is concentrated on the activity.
(b) Curiosity: If the user's cognitive curiosity is aroused (Malone, 1981a,b).
(c) Enjoyment: If the user enjoys the interaction with the system.

Perceived Playfulness has a positive effect on the behavioural intention of a CBA (Terzis & Economides, 2011). Previous studies on e-learning showed that there are significant differences between genders towards computer use (Mitra et al., 2000). However, more recently, prior research on e-learning acceptance found that Perceived Playfulness did not shown any gender differences (Wang et al., 2009). In our study, we expect that Perceived Playfulness will be higher for men than for women and it will have greater influence on Intention to Use for men than for women. The reason would be that CBA is more game oriented than e-learning since it has scores and performance. Men's characteristics match better with CBA's game orientation. Previous studies found that men loved playing computer games more than women (Bonanno & Kommers, 2008; Hartmann & Klimmt, 2006; Lockheed, 1985; Scott & Rockwell, 1997). Moreover, men expressed more positive feelings towards multi-choice assessments than females (Birenbaum & Feldman, 1998). Men may use the CBA as a game to enhance and test their knowledge. Therefore we hypothesized:

H1. Perceived Playfulness will be higher for men than for women.

H2. Perceived Playfulness influences Behavioural Intention to use CBA more strongly for men than for women.

3.2. Perceived Usefulness

Perceived Usefulness (PU) is determined as the degree to which a person believes that using a particular system will enhance his/her job performance (Davis, 1989). A strong influence of PU on BI and on PP has been found by many studies (e.g. Lee, 2008; Ong & Lai, 2006; Terzis & Economides, 2011; Van Raaij & Schepers, 2008). Moreover, previous studies showed a moderate effect of gender on PU (Ong & Lai, 2006; Venkatesh & Morris, 2000). That is, the influence of PU on BI and on PP will be stronger for men than for women. Thus, we hypothesized:

H3. Perceived Usefulness will be higher for men than for women.

H4. Perceived Usefulness influences Behavioural Intention to use CBA more strongly for men than for women.

H5. Perceived Usefulness influences Perceived Playfulness more strongly for men than for women.

3.3. Perceived Ease of Use

Perceived Ease of Use (PEOU) is defined as the degree to which a person believes that using the system would be free of effort (Davis, 1989). PU and BI are influenced by PEOU (Agarwal & Prasad, 1999; Hu, Chau, Sheng, & Tam, 1999; Venkatesh, 1999; Venkatesh & Davis, 1996). Moreover, the CBAAM showed that PEOU enhances PP. PEOU is more important for women since men are more familiar than women towards computer use (Kim, 2010; Ong & Lai, 2006; Venkatesh et al., 2003). So, the effect of PEOU on BI, PP and PU will be stronger for women.

H6. Perceived Ease of Use will be higher for men than for women.

H7. Perceived Ease of Use influences Behavioural Intention to use CBA more strongly for women than for men.

H8. Perceived Ease of Use influences Perceived Usefulness to use CBA more strongly for women than for men.

H9. Perceived Ease of Use influences Perceived Playfulness to use CBA more strongly for women than for men.

3.4. Computer Self Efficacy

Computer Self Efficacy (CSE) is determined as the individual's beliefs on his/her ability to use computers (Compeau & Higgins, 1995). In a CBA, computer self efficacy affects students' performance. Students with higher CSE are able to gain significant time only by clicking, typing or reading through the PC quicker.

Previous studies supported a causal link between Computer Self Efficacy and Perceived Ease of Use (Agarwal, Sambamurthy, & Stair, 2000; Padilla-Melendez, Garrido-Moreno, & Del Aguila-Obra, 2008; Terzis & Economides, 2011; Venkatesh & Davis, 1996).

Researchers also showed lower levels of computer self efficacy for women (Comber, Colley, Hargreaves, & Dorn, 1997; Durndell & Hagg, 2002; Durndell, Hagg, & Laithwaite, 2000; Vekiri & Chronaki, 2008; Whitely, 1997). Moreover, Ong and Lai (2006) supported that CSE influences PEOU more strongly for women than for men. Thus we hypothesized:

H10. Computer Self Efficacy will be higher for men than for women.

H11. Computer Self Efficacy influences Perceives Ease of Use more strongly for women than for men.

3.5. Social Influence

Social Influence (SI) is defined as the effect of other people's opinion, superior influence, and peer influence (Taylor & Todd, 1995). Three are the key elements of the social influence: Subjective Norm, Image and Voluntariness (Karahanna & Straub, 1999). Previous models measured Social Influence or similar variables with identical meaning: Social factors (MPCU), Image (IDT) and Subjective Norm (TRA, TPB, C-TAM-TPB and TAM2) (Venkatesh et al., 2003). TAM2 suggests a causal link between Subjective Norm and Image with users' perceptions about the system's usefulness. Moreover, Social Influence has been used into many proposed models (e.g. Agarwal & Karahanna, 2000; Karahanna & Straub, 1999; Lu, Yu, Liu, & Yao, 2003; Taylor & Todd, 1995; Venkatesh & Davis, 2000; Venkatesh et al., 2003; Wang et al., 2009). Also, the CBAAM found a causal link of SI to PU. Previous

studies suggest that emotions and social factors affect more strongly women, thus women's Social Influence effect will be stronger on behavioural intention (Venkatesh & Morris, 2000). Since the use of our system is voluntary, Social Influence has no direct effect on behavioural intention (Venkatesh & Davis, 2000). The effect on behavioural intention will be only indirect through the Perceived Usefulness.

H12. Social Influence will be higher for women than for men.

H13. Social Influence influences Perceived Usefulness more strongly for women than for men.

3.6. Facilitating Conditions

Facilitating Conditions (FC) correspond to services offered by the system in order to facilitate a user to perform a procedure. Thus, the appropriate description of FC depends on the persons that will provide them and the system's architecture and support. Helpdesks and online support services could be considered as FC. Resource factors such as time and money could be also considered as FC (Lu, Liu, Yu, & Wang, 2008). Organizational staff's communication and participation could be also defined as FC (Bueno & Salmeron, 2008).

The CBAAM suggested as FC the student's support during the CBA. The system and the organizational staff constitute the FC. The CBA's tools such as "Tutorial" and "Help" must be helpful to the students when they meet difficulties. In our experiment, support staff plays a significant role. During the CBA procedure, the presence of an expert was very important in order to overcome students' queries concerning the use of the CBA or even the content of the questions.

Since previous studies suggest that women's CSE is lower, we believe that FC will be more important for women than for men in order to overcome their computer anxiety. Thus, FC effect on PEOU will be stronger for women than for men.

H14. Facilitating Conditions will be higher for women than for men.

H15. Facilitating Conditions influences Perceived Ease of Use more strongly for women than for men.

3.7. Goal Expectancy

In distance learning, an e-learner is more self-directed and goal oriented by him/her self, since he/she works alone (Smith et al., 2003; Yi & Hwang, 2003). Self-management of learning is a proposed variable, which measured how the e-learner feels and whether he/she is self disciplined (Smith et al., 2003). Nicholls (1984) proposed Learning Goal Orientation and Performance Goal Orientation. Learning Goal Orientation has been used as an indirect determinant of e-learning acceptance (Yi & Hwang, 2003). Another important construct is outcome expectations (Bandura, 1986; Vroom, 1964) which refers to the expected consequence of one's own attitude. Compeau and Higgins (1995, 1999) proposed two types of outcome expectations regarding computer use: (1) performance related outcome expectations, (2) Personal Outcome Expectations. Personal Outcome Expectations have been introduced as an ancestor of intention to use (Shih, 2008).

Goal Expectancy (GE) was proposed in the CBAAM (Terzis & Economides, 2011). Goal Expectancy (GE) is a variable that influences an individual's belief that he/she is prepared properly to use the CBA. GE has two dimensions. In a summative assessment, students have to be prepared in order to evaluate their knowledge through the questions. Thus, the first dimension is student's preparation to take the CBA. It is clear that a tutor is not able to measure a students' preparation neither from a qualitative approach nor from a quantitative approach through the questionnaire and the system. Thus, the CBAAM actually measured if a student is satisfied with his/her preparation. Moreover, the students usually try to predict their performance based on their preparation and the hypothetical difficulty level of the assessment. In other words, they estimate their self confidence regarding their study and the assessment. Thus, the second dimension involves the desirable level of success for each student. In a summative assessment, the CBAAM demonstrated a positive effect of GE on PU and on PP. Previous studies showed that men are thought to be more competitive and aggressive than women (Eagly, Mladinic, & Otto, 1991; Williams & Bennet, 1975). Also, the experimental economics literature suggested that men tend to be more competitive than women (e.g. Gneezy & Rustichini, 2004; Niederle & Vesterlund, 2005). Moreover, men are more concerned with winning than women (White & Duda, 1994). Previous findings are also supported from studies regarding computer games which found that males are more motivated by challenge than females (e.g. Eglesz, Feteke, Kiss, & Izso, 2005; Greenberg, Sherry, Lachlan, Lucas, & Holmstrom, 2010). Thus, we believe that men will score higher in GE and that GE will influence PU and PP more strongly for men than women. So, we hypothesized:

H16. Goal Expectancy will be higher for men than women.

H17. Goal Expectancy influences Perceived Usefulness more strongly for men than for women.

H18. Goal Expectancy influences Perceived Playfulness more strongly for men than for women.

3.8. Content

Information and Communication Technology (ICT) is used in order to deliver learning and assessment content easier, faster and more efficiently to the students. Based on Doll and Torkzadeh (1988), Wang (2003) proposed Content to determine the e-learner's satisfaction. He examined if the content was sufficient, up-to-date, useful and fitted to the user's needs. Moreover, the content of the system and the contribution of the teachers during the construction, the operation and the maintenance of the system are very important for learner's satisfaction (Shee & Wang, 2008).

Correspondingly, course's content affects the CBA's use. The questions of the CBA are based on the course's content. The CBA offers two major advantages to instructors and learners. Firstly, the instructors are able to identify the students' progress regarding the course content. Secondly, the students have the opportunity to learn and practice better the course's content and identify their weaknesses. The CBAAM proposes two dimensions of the Content variable (Terzis & Economides, 2011). The first dimension, as we previously described, is related to the course's content. The course's content is a criterion for the student to evaluate the course as difficult or easy, interesting or boring, useful or not useful. Thus, the Content is crucial for the CBA's usefulness and playfulness. The second dimension is related to the questions during the CBA. The questions have to be clear, understandable and relative to the course's content in order to maximize the student's utility and satisfaction. The CBAAM detected that Content had a positive impact on PU, PP, GE and BI. Since the CBA's questions are designed based on a course regarding the basic knowledge of computer use,

we have to consider students' computer self efficacy in order to highlight gender differences regarding the effect of Content on PU, PP, GE and BI. In the literature review we showed that previous studies found contradictory results regarding genders' differences on computer use and self efficacy. However, taking into consideration the age and the country (Greece) that our research took place, previous studies showed that female students are likely to have less positive perceptions towards computer self efficacy than males (e.g. Vekiri & Chronaki, 2008). Therefore, we expect that men will score higher than women in this construct. Thus we hypothesized:

H19. Content will be higher for men than women.

H20. Content influences Perceived Usefulness more strongly for men than for women.

H21. Content influences Perceived Playfulness more strongly for men than for women.

H22. Content influences Goal Expectancy more strongly for men than for women.

H23. Content influences Behavioural Intention to use CBA more strongly for men than for women.

4. Methodology

4.1. Research participants and data collection

The experiment was conducted in an introductory informatics course, in the Department of Economic Sciences of a Greek University. The course is mandatory and contains theory and practice. In the theoretic module, students have to learn general concepts of ICT (Beekman & Quinn, 2007) and in the practical module students have to learn how to use Word Processing and Internet (Kinkoph, 2007). The CBA test includes questions from both modules.

In this first-year undergraduate class, there are 350 enrolled students from whom 129 students are men (37%) and 221 are women (63%). After asking for expression of interest to voluntarily participate in the CBA, 202 students completed the registration form. Finally, 173 students appeared to take the test.

Computer Self Efficacy (on the scale of 1–7) with mean = 5.03 and SD = 1.2 shows that students felt confident about the basic use of a Personal Computer (PC). Students felt familiar with the use of PC, since most of them also attended computer classes at high school. There were 56 males (33%) and 117 females (67%). The average age of the students was 18.4 (SD = 1.01). The use of the CBA was voluntary. The CBA consists of 45 multiple choice questions and its duration was 45 min. Each question had four possible answers. The questions' appearance to a student was randomized. After the end of the CBA, each student had to answer the survey which consisted of 30 questions (Appendix A).

The use of the CBA was very simple. Each student had to choose the correct answer and then he/she had to push the "next" button. Each page includes the question, the four possible answers and the "next" button (e.g. Moridis & Economides, 2009). The text was in Greek. Teachers did not give any other special instructions at the beginning of the test. Few students who were not very comfortable with the use of the system and asked help on its use received further information and instructions. The CBA's appearance was simple too in order to avoid the effects of design and aesthetics on constructs such as PP, PU or BI since these effects were not measured in the CBAAM (Terzis & Economides, 2011).

4.2. Measures

In this study, we used the measurements of the CBAAM. The CBAAM consists of 30 items which measure the nine latent variables of the model. The seven point Likert-type scale with 1 = "strongly disagree" to 7 = "strongly agree" was used to measure the items. Three items for Perceived Usefulness (PU) and three items for Perceived Ease of Use (PEOU) were adapted from Davis (1989). Four items for Computer Self Efficacy (CSE) were adapted from Compeau and Higgins (1995). Social Influence (SI) was measured by four items from the UTUAT (Venkatesh et al., 2003). Facilitating Conditions (FC) were measured by two items (Thompson, Higgins, & Howell, 1991). Based on Moon and Kim (2001) and Wang et al. (2009), four items were used to measure Perceived Playfulness (PP). Moreover, four and three items were used to measure the two newly proposed constructs, Content and Goal Expectancy (GE), respectively (Terzis & Economides, 2011). Behavioural Intention to Use was measured by 3 items from Davis (1989) (Appendix A).

4.3. Data analysis

The CBAAM has used the technique of partial least-squares (PLS) to analyze the measurement and the structural model. PLS (Chin, 1998; Falk & Miller, 1992; Wold, 1982) and Linear Structural Relations (LISREL) (Jöreskog & Sörbom, 1993) are the most common structural equation modeling (SEM) techniques. PLS analysis offers some advantages: (1) fewer demands on residual distributions; (2) smaller sample; (3) wider number of constructs and/or indicators (Chin, 1998; Falk & Miller, 1992); (4) testing theories in early stages of development (Fornell & Bookstein, 1982); (5) better for prediction.

Furthermore, the minimum recommended sample size is defined by the two following guidelines: (a) 10 times larger than the number of items for the most complex construct; (b) 10 times the largest number of independent variables impacting a dependent variable (Chin, 1998). The required sample size should be larger than the larger value of the above guidelines. The CBAAM has four independent variables impacting a dependent variable (e.g. Behavioural Intention to use). Thus, the minimum required sample size was 40, which is quite lower than the 173 participants in this study. In addition, many studies on technology acceptance on learning systems used PLS analysis (e.g. Han, 2003; Hsu, Chen, Chiu, & Ju, 2007; Van Raaij & Schepers, 2008; Yi & Hwang, 2003; Zhang, Zhao, & Tan, 2008).

Reliability and validity of the measurement model are proved by the internal consistency, convergent validity and discriminant validity (Barclay, Higgins, & Thompson, 1995; Wixon & Watson, 2001). Firstly, the items' factor loadings on the corresponded constructs must have a value 0.7 and higher in order to be acceptable (e.g. Teo, 2009). The discriminant validity is also satisfied by the stronger items' factor loading on their own corresponded variables than on other variables in the model. Moreover, average variance extracted (AVE) should be higher than 0.5 and the AVE's squared root of each construct should be greater than any correlation with every other construct (Barclay et al., 1995; Chin, 1998; Fornell & Larcker, 1981). The composite reliability has to be greater than 0.7 (Agarwal & Karahanna, 2000; Compeau, Higgins, & Huff, 1999). These criteria regarding our measurement model are satisfied and demonstrated at Table 3. However, we analysed extensively all the results regarding measurement and structural model in Section 5.

The structural model and hypotheses have to satisfy two criteria: (1) the variance measured (R^2) by the antecedent constructs. Values of the variance equal to 0.02, 0.13 and 0.26 are considered as small, medium and large respectively (Cohen,

1988); (2) *t*-values through the bootstrapping procedure show the significance of the path coefficients and total effects.

In PLS, multigroup analysis (MGA) investigates if the difference in path coefficients of two different groups is statistical significant in order to confirm differences in different population parameters. *T*-test was first used regarding the multigroup analysis, in order to find the differences between groups (Keil et al., 2000). This approach had some drawbacks, since PLS path modeling (in contrast to *t*-test) is a distribution-free method (Chin & Dibbern, 2010). Henseler (2007) proposed a new method for PLS-based multigroup analysis. This method does not follow distributional assumptions. This technique examines if the difference between the path coefficients of the two subpopulations is statistically significant. In particular, this method is similar to Mann–Whitney–Wilconox test (Mann & Whitney, 1947; Wilcoxon, 1947). The exact equation is (Henseler, Ringle, & Sinkovics, 2009):

$$P(b^{(1)} > b^{(2)} | \beta^{(1)} \leqslant \beta^{(2)}) = 1 - \sum_{\forall j,i} \frac{\Theta(2b-^{(1)} - bj-^{(2)} + bi^{(2)})}{J^2}$$

J, the number of bootstrap samples. $b_j^{(1)}$ and $b_i^{(2)}$, the bootstrap parameter estimations, where the superscripts denote the corresponding group. $b^{-(1)}$ and $b^{-(2)}$, the means of the focal parameters over the bootstrap samples, where the superscripts denote the corresponding group. Θ, the unit step function. $\Theta = 1$ if its argument exceeds 0, else $\Theta = 0$.

Thus, we used this method in order to evaluate the differences between the path coefficients of men and women.

We used SmartPLS 2.0 for data analysis (Ringle, Wende, & Will, 2005). SmartPLS uses the partial least squares (PLS) method and it is similar to the well known PLS-Graph.

5. Results

Table 3 presents the items' factor loadings and the convergent validity. The measurement model is supported, since all the factor loadings are greater than 0.7, the composite reliability is greater than 0.7 and the average variance extracted (AVE) is greater than 0.5. Table 4 verifies the discriminant validity. In Table 4, the diagonal elements are the AVEs. The AVE of each construct is higher than any correlation with another construct (Fornell & Larcker, 1981). Table 5 summarizes the mean scores, standard deviations, significant *F* ratios and the effects of each gender upon the nine latent constructs. Significant gender differences were found for PP, PU, CSE, FC and GE. Men's ratings of Perceived Playfulness, Perceived Usefulness, Computer Self Efficacy and Goal Expectancy were higher than women's. Moreover, women's ratings of

Table 3
Results for the measurement model.

construct items	Mean	Standard deviation	Factor loading (>0.7)[a]	Cronbach a (>0.7)[a]	Composite reliability (>0.7)[a]	Average variance extracted (>0.5)[a]
Perceived Playfulness	5.46	1.02		0.8444	0.8955	0.6822
PP1			0.7672			
PP2			0.8501			
PP3			0.8411			
PP4			0.8426			
Perceived Usefulness	5.77	0.96		0.8183	0.8920	0.7336
PU1			0.8322			
PU2			0.8797			
PU3			0.8568			
Perceived Ease of Use	5.77	1		0.7900	0.8782	0.7072
PEOU1			0.8424			
PEOU2			0.9046			
PEOU3			0.7704			
Computer Self Efficacy	5.03	1.2		0.9009	0.9301	0.7690
CSE1			0.8655			
CSE2			0.8642			
CSE3			0.9015			
CSE4			0.876			
Social Influence	6.1	0.86		0.7952	0.8676	0.6227
SI1			0.8292			
SI2			0.8732			
SI3			0.7257			
SI4			0.717			
Facilitating Conditions	6.62	0.69		0.8755	0.9411	0.8888
FC1			0.9511			
FC2			0.9343			
Goal Expectancy	5.02	1.01		0.7241	0.8385	0.6339
GE1			0.8293			
GE2			0.7722			
GE3			0.786			
Content	5.63	0.86		0.7898	0.8625	0.6113
C1			0.8211			
C2			0.7582			
C3			0.72			
C4			0.8233			
Behavioural Intention to Use	6.00	1.06		0.8873	0.9306	0.8175
BI1			0.9461			
BI2			0.9149			
BI3			0.8487			

[a] Indicates an acceptable level of reliability and validity.

Facilitating Conditions were higher than men's. Thus, H1, H3, H10, H14 and H16 are supported (Table 5).

A bootstrap procedure with 1000 resamples was used to examine the statistical significance of the relations in the structural model. Fig. 3 as well as Tables 6 and 8 show the results for the entire sample and for the two genders.

In addition, the R^2 values can be used as a goodness-of-fit measure (Hulland, 1999). Table 4 shows the R^2 values for the entire sample and for each gender respectively. The R^2 values regarding the two genders were also encouraging. BI's variance is explained almost for 50% for both genders. The results regarding men were very good for all the variables (BI, PP, PU, PEOU, GE) that are explained by other constructs. All the variables in men's structural model are explained for 50% approximately. Likewise, women's structural model had very good results for BI, PP and PU with 50% of explained variance for each construct. However, women's R^2 values for PEOU and GE were lower but acceptable with 17% and 14% respectively (Table 4).

Moreover, the last column of Table 6 shows the significance of the difference between the path coefficients of women and men in the structural model, based on the method of Henseler et al. (2009). Table 7 summarizes the results for the hypotheses.

Regarding the differences between the two genders, Perceived Usefulness influenced Behavioural Intention more strongly for men than for women. Thus, hypothesis H4 is supported. Moreover, Perceived Ease of Use determined Behavioural Intention and Perceived Usefulness more strongly for women than for men. Thus hypotheses H7 and H8 are supported. Furthermore, Content influenced Perceived Usefulness, Perceived Playfulness and Goal Expectancy more strongly for men than for women. So, hypotheses H20, H21 and H22 are confirmed. However, the hypothesized stronger effects of Perceived Playfulness on Behavioural Intention for men (H2) did not confirm. Likewise the path coefficients for the PU → PP (H5), PEOU → PP (H9), CSE → PEOU (H11), C → BI (H23) links did not differ between the two gender groups. Unexpectedly, the path coefficients for the SI → PU (H13), FC → PEOU (H15) links are stronger for men and the GE → PU (H17), GE → PP (H18) links are stronger for women. The four previous path coefficients are statistically significant and the results are against our hypothesis.

6. Discussions

The aim of this study is to extend prior knowledge on the technology acceptance model and gender differences in the field of CBA. The CBAAM showed that a CBA would be more likely for students to use it if it is playful and easy to use. Previous studies also proposed PEOU and PP as major determinants of BI (Davis, 1989; Moon & Kim, 2001; Wang et al., 2009). Moreover, CSE and FC have a direct positive effect on Perceived Ease of Use. These mean that students with prior knowledge on using PCs probably will find the system easy to use and that the appropriate support from the staff and from the system itself will also make the system easy to use. Since PEOU is an important determinant of BI, FC and CSE, it could be very crucial for the actual use of the system. Social Influence is also a strong determinant of Perceived Usefulness. Thus, the student's social environment is very important in order to understand the usefulness of the CBA. This result strongly supports the relationship established in TAM2 (Lu, Yaob, & Yu, 2005; Venkatesh & Davis, 2000).

Moreover, GE shows that a well prepared student with expectations to be successful would be more likely to find the CBA useful and playful. In Section 3, we explained that the positive effect exists only in summative assessments. On the other hand, Content's direct effect on Behavioural Intention is not confirmed. However, hypotheses for direct effect of Content on Perceived Usefulness, Perceived Playfulness and Goal Expectancy are confirmed. Thus, Content's indirect effect on Behavioural Intention through PP, PU and GE is very strong. This means that, a CBA with clear and interesting Content for the students would be more useful and playful, so it would be more likely to be used. Since students determine their efforts based on the course content, students' Goal Expectancy is affected by the CBA's Content.

Contrary to previous studies, the CBAAM did not confirm the direct effect of Perceived Usefulness on Behavioural Intention to Use. However, Perceived Usefulness' indirect effect on Behavioural Intention to use through the Perceived Playfulness was very strong. This means that a useful CBA is more likely to be playful. In other words, the students will have probably concentration, curiosity and enjoyment when they use a useful CBA. In our model,

Table 4
Discriminant validity for the measurement model.

Construct	PP	PU	PEOU	CSE	SI	FC	GE	C	BI
PP	**0.826**								
PU	0.577	**0.857**							
PEOU	0.496	0.514	**0.841**						
CSE	0.377	0.256	0.330	**0.877**					
SI	0.463	0.489	0.358	0.256	**0.789**				
FC	0.286	0.258	0.408	0.166	0.518	**0.943**			
GE	0.497	0.515	0.295	0.217	0.439	0.187	**0.796**		
C	0.567	0.554	0.522	0.403	0.504	0.483	0.494	**0.782**	
BI	0.656	0.522	0.524	0.345	0.325	0.287	0.382	0.502	**0.904**

Table 5
Descriptive statistics and ANOVAs testing results.

	Men (n = 56)		Women (n = 117)		Significance of difference between women and men		
	Mean	SD	Mean	SD	F ratios	Sig.	Effect size Cohen's d
PP	6.56	0.773	5.35	1.035	60.311	0.000	1.32
PU	5.97	0.870	5.68	0.985	3.447	0.065	0.31
PEOU	5.93	0.883	5.69	1.038	2.374	0.125	0.25
CSE	5.27	1.090	4.91	1.227	3.474	0.064	0.31
SI	6.31	0.885	6.09	0.884	2.452	0.119	0.25
FC	5.04	0.967	6.64	0.643	168.346	0.000	1.95
GE	6.14	0.789	5.01	1.032	52.854	0.000	1.23
C	5.63	0.886	5.64	0.847	0.016	0.899	0.01
BI	5.70	0.939	5.84	1.101	0.705	0.402	0.13

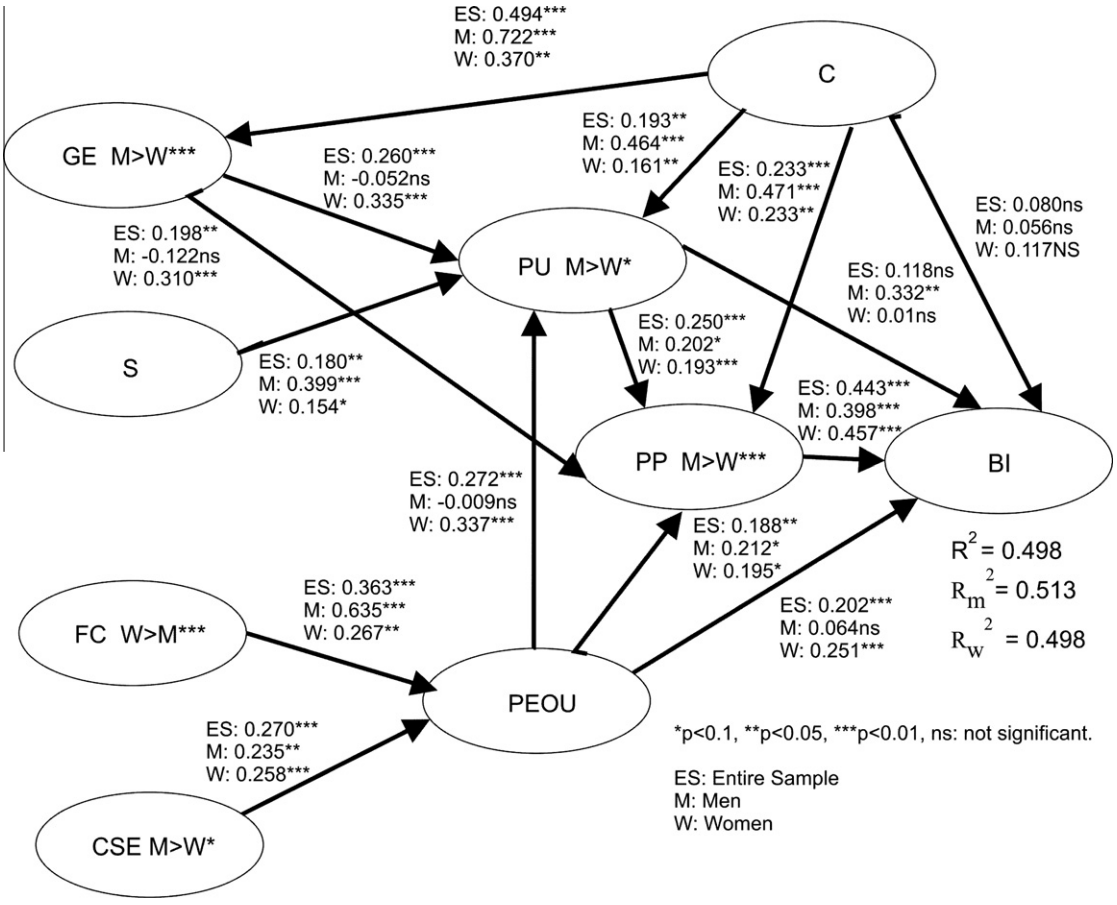

Fig. 3. Path coefficients of the research model (CBAAM and Genders) and differences in perceptions.

Table 6
Entire sample and gender differences in relationships.

	Entire sample		Men (n = 56)		Women (n = 117)		Difference between women and men (Henseler method)
	R^2	β	R^2_m	β_m	R^2_w	β_w	
BI	0.498		0.513		0.498		
PP	0.468		0.456		0.508		
PU	0.469		0.479		0.524		
PEOU	0.237		0.51		0.166		
GE	0.244		0.521		0.137		
PP → BI		0.443***		0.398***		0.457***	ns
PU → BI		0.118 ns		0.332**		0.01 ns	(0.021)**
PU → PP		0.250***		0.202*		0.193***	ns
PEOU → BI		0.202***		0.064 ns		0.251***	(0.909)*
PEOU → PU		0.272***		−0.009 ns		0.337***	(0.011)**
PEOU → PP		0.188**		0.212*		0.195*	ns
CSE → PEOU		0.270***		0.235**		0.258***	ns
SI → PU		0.180**		0.399***		0.154*	(0.0355)**
FC → PEOU		0.363***		0.635***		0.267**	(0.0055)***
GE → PU		0.260***		−0.052 ns		0.335***	(0.001)***
GE → PP		0.198**		−0.122 ns		0.310***	(0.002)***
C → PU		0.193**		0.464***		0.161**	(0,0401)**
C → PP		0.233***		0.471***		0.233**	(0,0672)*
C → GE		0.494***		0.722***		0.370**	(0,0031)***
C → BI		0.080 ns		0.056 ns		0.117 ns	ns

ns: not significant.
* $p < 0.1$.
** $p < 0.05$.
*** $p < 0.01$.

Playfulness is a mediator connecting Usefulness with Behavioural Intention to Use. This result has to be examined further in order to show the actual relationship between Perceived Usefulness and Behavioural Intention to Use a CBA.

Table 7
Summary of testing results.

Perception			
H1	PP	Men > Women	Support***
H3	PU	Men > Women	Support*
H6	PEOU	Men > Women	Not support
H10	CSE	Men > Women	support*
H12	SI	Women > Men	Not support
H14	FC	Women > Men	Support***
H16	GE	Men > Women	Support***
H19	C	Men > Women	Not support
Relationship			
H2	PP → BI	Men > Women	Not support
H4	PU → BI	Men > Women	Support**
H5	PU → PP	Men > Women	Not support
H7	PEOU → BI	Women > Men	Support*
H8	PEOU → PU	Women > Men	Support**
H9	PEOU → PP	Women > Men	Not support
H11	CSE → PEOU	Women > Men	Not support
H13	SI → PU	Women > Men	Support the opposite
H15	FC → PEOU	Women > Men	Support the opposite
H17	GE → PU	Men > Women	Support the opposite
H18	GE → PP	Men > Women	Support the opposite
H20	C → PU	Men > Women	Support**
H21	C → PP	Men > Women	Support*
H22	C → GE	Men > Women	Support***
H23	C → BI	Men > Women	Not support

ns: not significant.
* $p < 0.1$.
** $p < 0.05$.
*** $p < 0.01$.

6.1. Gender differences

The main research topic of this study is gender differences. Firstly, we examine the gender differences in perceptions of Goal Expectancy, Content, Social Influence, Perceived Playfulness, Perceived Usefulness, Perceived Ease of Use, Computer Self Efficacy and Facilitating Conditions. Men's ratings of perceptions regarding Perceived Playfulness, Perceived Usefulness, Computer Self Efficacy and Goal Expectancy are higher than women's as we hypothesized. However, our findings did not confirm men's higher ratings for Perceived Ease of Use as well for Content. This means that it was easy to use the CBA and the Content was clear, understandable, useful and relevant to the course for both genders. On the other hand, women's ratings of perceptions with respect to Facilitating Conditions confirmed our hypothesis and they are higher than men's. This means that support from the staff and from the system is more important for women. However, women's ratings of perceptions regarding Social Influence do not have any significant difference from men's ratings. This means that both genders are influenced about the same by their environment (e.g. fellow students, colleagues, teachers, tutors).

Furthermore, we also investigate the effects of different variables, demonstrating how the two genders differ concerning Behavioural Intention to Use. The results support some of our predictions. Tables 6 and 8 show the statistical significant effects for both genders. Regarding women, all the determinants are statistically significant except the effects of PU and C on BI. These results come along with the results for the entire sample. As we explained previously, probably the effects of Usefulness and Content are delivered on Behavioural Intention through the Playfulness. Since Playfulness is an important determinant of BI for women and PU and C are important determinants of PP, we believe that a CBA has to be useful and filled in with the appropriate content in order to be playful. A playful CBA will affect positively women's BI. The results confirmed this theory through the total effects for Content and partially for Perceived Usefulness since the effect of PU on PP is significant but the total effect of PU on BI for women is not significant.

Regarding men, five out of fifteen path coefficients are not statistically significant. The effect of PEOU on PU and BI, GE on PU and PP and C on BI are not statistically significant. The effect of PEOU on

Table 8
Direct, indirect and total effects.

DV	IV	Direct effect			Indirect effect			Total effect		
		ES	M	W	ES	M	W	ES	M	W
BI	PP	0.443	0.398	0.457	0.000	0.000	0.000	0.443***	0.398***	0.457***
	PU	0.118	0.332	0.01	0.111	0.081	0.089	0.229**	0.413***	0.099 ns
	PEOU	0.202	0.064	0.251	0.145	0.081	0.0122	0.347***	0.145 ns	0.373***
	CSE	0.000	0.000	0.000	0.094	0.034	0.096	0.094***	0.034 ns	0.096*
	SI	0.000	0.000	0.000	0.041	0.165	0.015	0.041***	0.165**	0.015 ns
	FC	0.000	0.000	0.000	0.126	0.092	0.099	0.126***	0.092 ns	0.099*
	GE	0.000	0.000	0.000	0.147	−0.07	0.175	0.147***	−0.070 ns	0.175**
	C	0.080	0.000	0.117	0.220	0.385	0.186	0.300*	0.385***	0.303***
PP	PU	0.250	0.202	0.193	0.000	0.000	0.000	0.250**	0.202 ns	0.193*
	PEOU	0.188	0.212	0.195	0.068	−0.003	0.064	0.256***	0.209 ns	0.259***
	CSE	0.000	0.000	0.000	0.069	0.049	0.067	0.069*	0.049 ns	0.067**
	SI	0.000	0.000	0.000	0.045	0.080	0.023	0.045*	0.080 ns	0.023 ns
	FC	0.000	0.000	0.000	0.093	0.133	0.069	0.093**	0.133 ns	0.069*
	GE	0.198	−0.122	0.310	0.064	−0.010	0.065	0.262***	−0.132 ns	0.375***
	C	0.233	0.471	0.233	0.178	−0.002	0.169	0.411***	0.469***	0.402***
PU	PEOU	0.272	−0.009	0.337	0.000	0.000	0.000	0.272***	−0.009 ns	0.337***
	CSE	0.000	0.000	0.000	0.073	−0.002	0.087	0.073***	−0.002 ns	0.087***
	SI	0.180	0.399	0.154	0.000	0.000	0.000	0.180**	0.399***	0.154*
	FC	0.000	0.000	0.000	0.099	−0.005	0.089	0.099***	−0.005 ns	0.089**
	GE	0.260	−0.052	0.335	0.000	0.000	0.000	0.260***	−0.052 ns	0.335**
	C	0.193	0.464	0.161	0.129	−0.005	0.124	0.322***	0.427***	0.285***
PEOU	CSE	0.270	0.235	0.258	0.000	0.000	0.000	0.270***	0.235**	0.258**
	FC	0.363	0.635	0.267	0.000	0.000	0.000	0.363***	0.635***	0.267**
GE	C	0.494	0.722	0.370	0.000	0.000	0.000	0.494***	0.722***	0.370***

ns: not significant.
* $p < 0.1$.
** $p < 0.05$.
*** $p < 0.01$.

PU and BI is a presumable result. PEOU is not very important for men, since they are more confident with the use of PC and they do not give enough attention on Ease of Use. This result comes along with the insignificant total effect of PEOU on BI. Thus, Ease of Use does not play important role for men as for women in order to use and find useful the CBA.

Moreover, the effect of Goal Expectancy on Perceived Usefulness and Perceived Playfulness for men is not significant. Thus, the difference between men's and women's path coefficients for GE to PU and GE to PP is also statistically significant. These results are exactly the opposite of our hypotheses. However, previous studies came up to similar results. Particularly, Wang, Wu, and Wang (2009) found that self-management of learning, which is a construct similar to Goal Expectancy, had greater effect for women than for men. If future works continue to find the same results, then we may have to redefine our hypotheses regarding the effect of gender on path coefficients for GE and SML to PU, PP and BI.

Furthermore, concerning the gender differences regarding the path coefficients we find some other interesting results. First, the effect of Social Influence on Perceived Usefulness is higher for men than for women. This result is against to our hypothesis and previous works (e.g. Venkatesh et al., 2003). However, Wang et al. (2009) came to a similar result. They found that the effect of Social Influence on Behavioural Intention for m-learning systems were higher for men than for women. Moreover, previous studies found that in the performance-related context, male users are more strongly influenced by social influence than females (Kim, 2010; Venkatesh & Morris, 2000). Male students are more familiar with using computers, thus they are more capable to understand and discuss the parameters of the CBA with each other or with their teachers. Women are shyer and less confident to talk about the use of PCs, so they formulate an opinion about the usefulness of the system by their own. Males' familiarization with computers is also the reason that the effect of Facilitating Conditions on Perceived Ease of Use is higher for men than for women. Male students are more efficient to use the support of the system than females. However, this is not very important, since PEOU does not have any effect on BI for men.

Second, the effect of Perceived Playfulness on Behavioural Intention to use is significant for both genders without significant differences among genders. As we have said before, probably a playful CBA attracts men and women to use.

Third, the effect of Perceived Usefulness on Behavioural Intention is significant only for men. This finding suggests that men through the procedure of the CBA want to gain useful results such as better knowledge of the course or better grades. Men are thought to be more competitive (Eagly, Mladinic, & Otto, 1991; Williams & Bennet, 1975). Thus, they probably thought, that the CBA is a useful and educational game in order to satisfy their need to show their superiority or dominance over their other colleagues. This idea is also supported by the fact that the majority of men participants were asking repeatedly what was the highest possible score to achieve before the CBA begins. Thus, men satisfy their competiveness through Perceived Usefulness and Playfulness and not through Goal Expectancy which is a variable that indicates also the preparation for the CBA. The fact that men are more competitive does not mean that they will be better prepared than women.

Fourth, the effect of Content on Perceived Usefulness, Perceived Playfulness and Goal Expectancy is higher for men than for women. This means that men are influenced stronger than women from Content, in order to find the CBA useful and playful. The higher effect of Content on Goal Expectancy for men could be explained by the course's content, which is introductory informatics. Since men are more familiar with the use of PCs they believe that they are "experts" with regards to the course's content and expect to achieve better scores. It is possible that in other courses (e.g. Language, Literature) this effect might be stronger for women. Content is a very important construct for a CBA. The direct effect of Content on Behavioural Intention is not significant for each gender in comparison with the entire sample. However, the total effect of Content on Behavioural Intention through Perceived Playfulness and Perceived Usefulness is very strong for both genders.

7. Conclusions

Computer based assessment is an important tool in the educational procedure. This study investigates how gender moderates the influence of various factors on Behavioural Intention to Use a CBA. Moreover, the proposed model helps to indentify gender needs in the CBA environment. This study supports previous research in the field of Learning Management Systems acceptance and presents new interesting results. The gender analysis provides better explanations for the determinants of the CBA's acceptance and improves the CBAAM.

According to the results of this study, tutors and practitioners could be able to understand how various factors influence differently male and female students. So, they could take advantage of these differences in practice to develop better CBA.

The male students are influenced to use a CBA through Playfulness, Usefulness, Content and Social Influence. Thus in order to persuade the male students to use the CBA system, the educators and developers have to correspond to the following: (1) the CBA should be playful, (2) the CBA must be useful to enhance the male student's knowledge and performance, (3) the CBA has to deliver the appropriate content which has to be clear, understandable and relevant to the course, and (4) the CBA should be recommended and suggested by their fellow students and teachers because male students are influenced by their social environment.

On the other hand, female students are mainly influenced to use the CBA through Playfulness, Ease of Use, Content and Goal Expectancy. Thus, Playfulness and Content are also important for females as well, but not to the same degree as for males. However, female student's Behavioural Intention is defined also by Ease of Use and Goal Expectancy and not by Usefulness and Social Influence as male. This means that: (1) the CBA's environment has to be easy to use with simple design (buttons, figures, etc.) and with logical flow in order the user to understand where exactly s/he is and how to move back and forward, (2) the course has to stimulate the female student's interest in order to maximize her desire for preparation and raise her expectations.

However, this study suffers from some limitations. Gender differences regarding the CBA acceptance model is quite a new topic thus other important variables should be added by the future studies. Second limitation is the sample size. Even if we have used PLS analysis which is appropriate for small samples, we might have led to biased results. Moreover, the sample is not equal for both genders. Thus the results for men (who constitute the group with the smaller number of participants) could be slightly different if more men participated in the study. Furthermore, in some cases we used .10 as the lowest level of significance which is lenient. Third, the sample is very specific. Participants are first-year undergraduate Greek students. Fourth, the course was Introduction to Informatics. Thus the model has to be examined in other courses, departments, countries and CBA systems with other characteristics. Moreover, gender differences regarding the CBA acceptance should be researched with regards to other different characteristics such as age, occupation and nationality for further confirmation and generalization of our results.

To conclude, the contribution of this study is to advance the knowledge on how gender alters the paths of determinant

Table A1

Constructs	Items	
Perceived Usefulness	PU1	Using the Computer Based Assessement (CBA) will improve my work
	PU2	Using the Computer Based Assessement (CBA) will enhance my effectiveness
	PU3	Using the Computer Based Assessement (CBA) will increase my productivity
Perceived Ease of Use	PEOU1	My interaction with the system is clear and understandable
	PEOU2	It is easy for me to become skilful in using the system
	PEOU3	I find the system easy to use.
Computer Self Efficacy	CSE1	I could complete a job or task using the computer
	CSE2	I could complete a job or task using the computer if someone showed how to do it first
	CSE3	I can navigate easily through the Web to find any information I need
	CSE4	I was fully able to use the computer and Internet before I began using the Computer Based Assessement (CBA)
Social Influence	SI1	People who influence my behaviour think that I should use CBA
	SI2	People who are important to me think that I should use CBA
	SI3	The seniors in my university have been helpful in the use of CBA
	SI4	In general, my university has supported the use of CBA
Facilitating Conditions	FC1	When I need help to use the CBA, someone is there to help me
	FC2	When I need help to learn to use the CBA, system's help support is there to teach me
Content	C1	CBA's questions were clear and understandable
	C2	CBA's questions were easy to answer
	C3	CBA's questions were relative to the course's syllabus
	C4	CBA's questions were useful for my course
Goal Expectancy	GE1	My Course's preparation was sufficient for the CBA
	GE2	My personal preparation for the CBA
	GE3	My performance expectations for the CBA
Perceived Playfulness	PP1	Using CBA keeps me happy for my task
	PP2	Using CBA gives me enjoyment for my learning
	PP3	Using CBA, my curiosity is stimulated
	PP4	Using CBA will lead to my exploration
Behavioural Intention to use CBA	BI1	I intend to use CBA in the future
	BI2	I predict I would use CBA in the future
	BI3	I plan to use CBA in the future

variables on behavioural intention to use a CBA, and to suggest guidelines on facilitating the acceptance of a CBA with respect to each gender.

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Appendix A

See Table A1.

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