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Continuance acceptance of computer based assessment through the integration of user's expectations and perceptions

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ABSTRACT

The Information Systems (IS) community has put considerable effort on identifying constructs that may explain the initial/continuance use of computer based learning or assessment systems. This study is a further step toward IS continuance acceptance delivered in Computer Based Assessment (CBA) context. Specifically, it aims at the exploration of continuance acceptance in CBA context and the development of a new approach for continuance use. This approach is applied by measuring user's expectations before the interaction with the system and user's perceptions after the interaction. The sign (±) and the intensity of the difference between pre and post measures is actually the strength that drives users to continuance intention to use. Through these measurements it is possible to estimate student's level of confirmation for each essential determinant of CBA continuance acceptance. Results underline Confirmed Ease of Use and Confirmed Playfulness as the direct determinants of continuance acceptance. Through Confirmed Playfulness important determinants, such as Confirmed Usefulness and Confirmed Content influence Continuance Behavioral Intention. Confirmed Facilitating Conditions and Confirmed Goal determine Confirmed Ease of Use and Confirmed Usefulness respectively. Important implications of these results are discussed.

1. Introduction

As use of information technology becomes integral part of learning procedures, researchers explore what motivates learners to accept Learning Management Systems (LMS). Numerous researchers have identified variables that may explain the use of computer based learning or assessment systems. While previous studies mainly investigated the initial acceptance of LMS, continuance usage and acceptance of LMS have not yet attracted the same level of attention. Nevertheless, continuance usage and acceptance are crucial when designing and implementing LMS. Part of these systems is computer based assessment (CBA). Summative and Formative CBAs provide many advantages to tutors and learners such as: time and place flexibility, immediate feedback and results, cost reduction, learner's self-evaluation and learner's evaluation by tutors. Previous studies highlighted Perceived Playfulness and Perceived Ease of Use as the most important determinants of CBA's acceptance (e.g. Terzis & Economides, 2011a).

However, the development of a research model that explains the continuance usage will extend previous knowledge and it will help developers to provide better services for learners and tutors. The current study attempts to identify the factors affecting learner's continuance usage in the context of Computer Based Assessment (CBA) by proposing a new approach.

LMS initial or continuance acceptance is based on Information Systems (IS) acceptance literature. Initial acceptance of IS is expressed by notable theories and models such as theory of planned behavior (TPB) (Ajzen, 1991) or technology acceptance model (TAM) (Davis, 1989). These theories were evolved by other researchers by adding new variables (e.g. Karahanna, Straub, & Chervany, 1999) or by combining previous theories (Venkatesh, Morris, Davis, & Davis, 2003) in order to explain more efficiently the users' behavioral intention. These models have been extensively used in many different contexts such as internet, e-mail, e-banking, e-commerce, e-learning, software etc.

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On the other side continuance acceptance takes into consideration user's expectations and the evolvement of user's perceptions over time. Previous findings showed that there are different motivations for pre-adopters and post-adopters (Karahanna et al., 1999). Bhattacherjee (2001a), introduced a post-acceptance confirmation model, the Expectation-Confirmation Model (ECM), based on expectation-confirmation theory (ECT) (Oliver, 1980) and TAM (Davis, 1989). ECT supports that satisfaction is the most important variable regarding continuance use of a product or a service, and it examines both pre-consumption and post-consumption variables in order to define satisfaction, while, TAM supports that the intention to use a system is defined by Perceived Usefulness and Perceived Ease of Use. Therefore, ECM explains IS continuance intention with post adoption expectations (Perceived Usefulness), satisfaction and confirmation.

In the last decade, various researchers inspired by ECT and ECM in order to investigate IS continuance acceptance. Recently, ECM expanded with Perceived Enjoyment, Perceived Playfulness, Perceived Ease of Use, self-image congruity and regret, past use (Hong, Thong, & Tam, 2006; Kang, Hong, & Lee, 2009; Lin, Wu, & Tsai, 2005; Thong, Hong, & Tam, 2006). Moreover, other researchers combined ECT or ECM with other theories such as task-technology fit (TTF) (Larsen, Sorebo, & Sorebo, 2009) and Theory of Planned Behavior (Liao, Chen, & Yen, 2007). Kim and Malhotra (2005) proposed a longitudinal model of continued IS use which combines TAM with updating and feedback mechanisms and repeated behavioral patterns (habits).

Previous studies and theories have been adopted, applied, combined and evolved by many researchers in e-learning context in order to explain continuance use (Chiu, Hsu, Sun, Lin, & Sun, 2005; Chiu, Sun, Sun, & Ju, 2007; Chiu & Wang, 2008; Lee, 2010; Limayem & Cheung, 2008; Roca, Chiu, & Martinez, 2006; Wang, Wang, & Shee, 2007).

However, previous models treated expectations, perceptions and confirmation as separate and different variables. This study, based on disconfirmation theory (Churchill & Surprenant, 1982; Sherif & Hovland, 1961), proposes a model which combines learner's expectations before use and intentions after use for each variable in order to measure the actual interaction between learner and system and its impact on behavioral intention. The actual interaction for each variable will explain if a learner wants to continue to use the system. Since the model proposed in this paper involves a CBA context, we used variables that have already been proposed by Computer Based Assessment Acceptance Model (CBAAM) such as Perceived Playfulness, Perceived Usefulness, Perceived Ease of Use and Content to explore continuance use of CBA (Terzis & Economides, 2011a). Thus, this study has two goals: (1) the development of a new approach for continuance use by using disconfirmation theory, and (2) the exploration of continuance acceptance in CBA context.

The organization of this paper is the following: In Section 2, we present the theoretical background which led to the development of the proposed model. Section 3 describes the proposed model. Section 4 and 5 demonstrate the data analysis and the results. Section 6 discusses the research findings. Finally, Section 7 presents implications, limitations, and conclusions of this study, as well as directions for further research.

2. Theoretical background

2.1. Continuance use in IS

ECM is the most known model for IS continuance explanation. ECM treats IT users' continuance decisions as consumers' repurchase decisions. Satisfaction, Confirmation, and Perceived Usefulness determine users' intentions to continue to use an IS. Thus, ECM differentiates from ECT toward three directions. First, ECM claims that pre-acceptance variables are included in confirmation and satisfaction constructs. Second, Perceived Usefulness was used to measured post-acceptance expectations. Perceived Usefulness was the only construct consistently influencing user intention in both adoption and post-adoption phases. Third, ECM includes perceived performance into confirmation construct.

Bhattacherjee (2001b) extends ECM with Loyalty incentives in the context of electronic commerce. Loyalty incentives did not have a direct effect on continuance intention, but it was significant with Perceived Usefulness. Bhattacherjee and Premkumar (2004) developed further ECM with a longitudinal study and they found that disconfirmation and satisfaction are the two most important constructs to understand IT users' belief and attitude change through time. ECM was also extended with Perceived Playfulness (Lin et al., 2005). Perceived Playfulness has a significant effect on Satisfaction and on Continuance Intention. Another contribution regarding the expansion of ECM was the inclusion of more post-adoption beliefs such as Perceived Ease of Use and Perceived Enjoyment (Min & Shenghua, 2007; Thong et al., 2006). Moreover, the effects of "self-image congruity" and "regret" on continuance intention are mentioned (Kang et al., 2009). Another study highlighted the moderating effects of cultural context and student samples (Islam & Mäntymäki, 2011).

Other researchers attempted to integrate or combine ECM with other theories and models such as Technology Acceptance Model (TAM) and Theory of Planned Behavior (TPB) (e.g. Lee, 2010). First, ECM was integrated with TPB (Liao et al., 2007). They found that continuance intention for online services is determined by satisfaction, Perceived Usefulness and subjective norm. These findings evolved ECM by taking into consideration the impact of subjective norm on continuance intention. ECM was combined also with Task-Technology Fit (TTF) and Utilization in the context of e-learning (Larsen et al., 2009). This study added that continuance intention is higher when the information system is work-centric and it provides Utilization. Recently, ECM was connected with personality traits through the five-factor model (FFM) (Lin & Ong, 2010, pp. 367–376). This study showed that personality constructs and especially agreeableness influences ECM constructs. In addition, polynomial modeling and response surface analysis were applied in order to further improve the predictability of ECM (Venkatesh & Goyal, 2010). Moreover a study regarding the post-adoption of electronic medical records integrated ECM with TAM (Shaw & Manwani, 2011). The aforementioned research provided an interesting qualitative analysis which showed that feature usage a variable more specific than the general variable of system use, is influenced by their prior experience with the system and the Perceived Usefulness of the feature.

ECM was introduced and further developed in many different contexts. Cross-Channel Instant Messaging continuance use was evaluated through the integration of ECM with the Process Virtualization Theory (PVT) by introducing variables such as communication process's dimensions of sensory, synchronism, relationship, and identification & control (Mengxiang, Lih-Bin, & Kanliang, 2009). A new context that user's continuance behavior is studying microblogging services, virtual worlds and Social Networking Sites (SNS). Particularly, a study found that user's intentions regarding continued use of Twitter is mainly influenced by Perceived Usefulness, satisfaction and habit (Barnes & Böhringer, 2011). Habit occurs also in other studies as a crucial variable regarding continuance usage (Wilson, Mao, & Lankton, 2010) Another study suggested that user's intention to use the Twitter continuously is determined by social presence, Perceived Enjoyment, and

Perceived Ease of Use (Park & Lee, 2010). In the context of Social virtual worlds (SVWs) continuance usage is defined mainly by Perceived Enjoyment, Perceived Usefulness and purchasing. In addition, Purchasing is determined by the presence of other users in the SVW, while perceived network externalities predict Perceived Enjoyment and usefulness (Mantymaki & Salo, 2011). Moreover, another study revealed that perceived behavioral control and subjective norm were the most important determinants of continuous use (Mantymaki & Merikivi, 2010). Purposive and entertainment values are also found by another research as the most important determinant users' continuance intention to participate in an online community (Jin, Lee, & Cheung, 2010).

2.2. Continuance use in LMS

This subsection describes models that have been developed to explain learning systems' continuance use. One of the first implementation of ECM in e-learning context was the research of Hayashi, Chen, Ryan, and Wu (2004). They attempted to find a significant relationship between Computer Self Efficacy and ECM's variables, nevertheless without success.

Some studies introduced variables to explain more efficiently continuance intention in e-learning context. ECM in e-learning context expanded by adding prior behavior as determinant of IS continued use and habit's moderating effect on IS continuance intention and IS continued usage (Limayem & Cheung, 2008, 2011). Perceived usability, perceived quality, perceived value, and usability disconfirmation are also defined as determinants of continuance intention (Chiu et al., 2005). Moreover, information quality, system quality, system use, distributive fairness, procedural fairness and interactional fairness showed significant positive effects on satisfaction and consequently on continuance intention to use. The three dimensions of quality are also very essential for e-learning systems' success (Wang et al., 2007). Another study suggested satisfaction as the major determinant of continuance intention to use an e-learning system. The results also displayed that satisfaction is highly correlated with system quality, information quality, service quality, Perceived Usefulness, intrinsic, and perceived internet self-efficacy (Almahamid & Rub, 2011). Another research which combines the flow theory, expectation confirmation theory, and theories of motivation in business simulation games in the digital learning contexts, was also demonstrated Learning Satisfaction as the most crucial determinant of continuance intention to use an e-learning system (Liao & Wang, 2011). On the other hand, the three dimensions of fairness were combined with the four components of subjective task value such as attainment value, utility value, intrinsic value and cost in order to explain satisfaction and continuance intention (Chiu et al., 2007). Subjective task value was also combined with UTUAT and cost (Chiu & Wang, 2008). Cost is actually the amount of negative aspects, spent effort and lost opportunities that a user felt by using the system (Chiu & Wang, 2008). Likewise, the frequency of Negative Critical Incidents during the use of an e-learning system was presented as an indirect determinant of Continuance Usage through overall satisfaction and attitude (Lin, Chen, & Fang, 2010). Another study introduced confirmation of initial expectations, perceived control beliefs, and perceived system quality as significant predictors of users' post adoption through Perceived Usefulness (Islam, 2011). Moreover, another research highlighted perceived social ability, online learning readiness, and Perceived Usefulness as significant determinants of online learning system's continuance usage (Brahmasrene & Lee, 2012). However, they also suggested that cultural differences might affect the significance of these results. Furthermore, a study on patients' continued usage of e-learning technologies indicated that patient's education level is a strong determinant of continuance usage (Chou, Lin, Woung, & Tsai, 2012).

Other studies combined previous models or theories regarding acceptance in order to explain continuance intention to use an e-learning system. First, TAM was extended and combined with expectancy disconfirmation theory (Roca et al., 2006; Shin, Biocca, & Choo, 2011). This study showed that satisfaction and e-learning continuance intention are significantly attributed to perceived usability, perceived quality and subjective norm (Roca et al., 2006). Another useful study connected TAM with Self-Determination Theory (SDT) (Roca & Gagné, 2008). Particularly, this study supports that perceived autonomy support, perceived competence and perceived relatedness determine Perceived Usefulness, Perceived Playfulness and Perceived Ease of Use (Roca & Gagné, 2008). Furthermore, another research connected ECM, TAM, TPB and flow theory (Lee, 2010). This research confirmed the effect of satisfaction, Perceived Usefulness, subjective norm and perceived behavior control on e-learning continuance acceptance. Moreover, it introduced new variables such as concentration and attitude (Lee, 2010). A combined model of TAM with TPB was integrated with variables related with course and system, such as course flexibility, course quality, system functionality and system response (Liao, Liu, Pi, & Chou, 2010). Furthermore, ECM combined with user resistance in a mandatory system, in order to understand students' resistance and intention to discontinue using the system (Lin & Rivera-Sánchez, 2012). Other studies were dedicated to teacher's continuance intention to use an e-learning system. A very interesting research combined IS-continuance theory with self-determination theory. This study provided useful insights regarding the critical role of teachers' perceptions of autonomy and competence, in addition to their genuine interest and enjoyment in connection with their e-learning usage, as significant determinants of IS continuance variables (Sorebo, Halvari, Gulli, & Kristiansen, 2009). Similarly, another study revealed that teachers' satisfaction regarding e-learning system is mainly defined by confirmation of initial expectations, perceived system quality, Perceived Usefulness perceived support, and perceived compatibility (Islam, 2010).

Regarding CBA context, Computer Based Assessment Acceptance Model (CBAAM) proposed that Perceived Playfulness and Perceived Ease of Use have the most significant effect on student's intention to use a CBA system, followed by Perceived Usefulness, goal expectancy, content, facilitating conditions, computer self-efficacy and social influence.

However, CBAAM predicts initial use. Based on the most referred models regarding IS continuance use and CBAAM, this paper develops a causal model and suggests a new approach to explain continuance intention to use of a CBA system (Fig. 1).

3. Research method

3.1. Proposed approach

In this point, we describe the development of the proposed approach. Previous studies based on ECT and ECM used expectation, confirmation and satisfaction as three different and separate variables. However, users have already formed expectations before using products or services. These expectations are not an overall or separate variable. We believe that users have different levels of expectations, based on their prior use of similar products or advertisements or social influence. Thus, for all the crucial variables regarding acceptance,

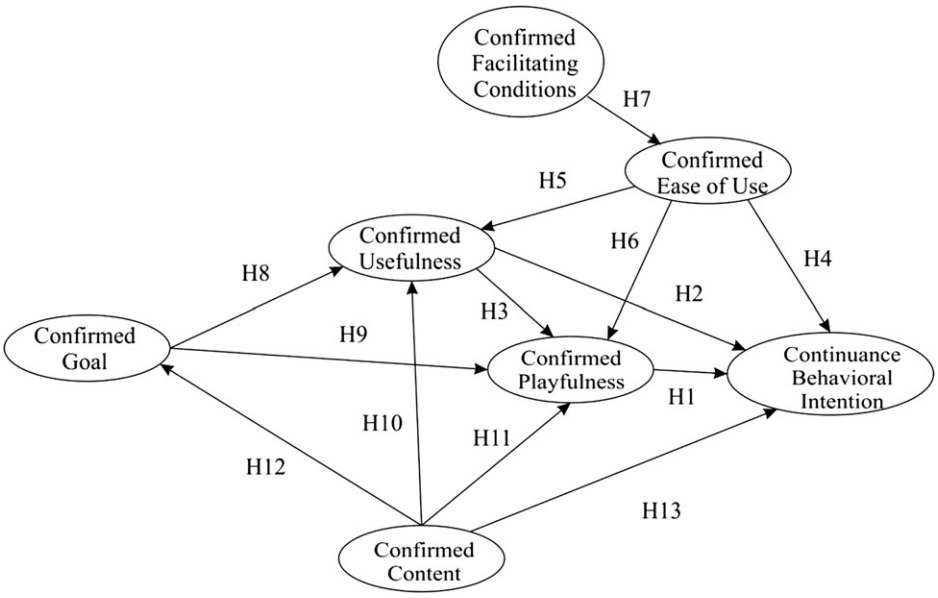

Fig. 1. The proposed research model.

such as Perceived Playfulness, Perceived Ease of Use, content and Perceived Usefulness, different levels of expectations emanate from user's interaction with the system and user's exposure to advertisement and/or social influence. Hence, users form an attitude toward variables regarding acceptance. The level of confirmation for each variable is actually the difference between the satisfaction's grades and expectation's grades regarding each variable.

For example, a user has a level of expectations regarding system's playfulness. After the interaction with the system the user formulates a level of satisfaction regarding system's playfulness. The sign (±) and the intensity of this difference is actually the strength that drives users to continuance intention to use.

This approach treats user's expectation, confirmation and satisfaction as variables of the same equation. Particularly, the level of user's confirmation is determined by the difference between satisfaction (post perceptions) and expectation (pre perceptions). This difference is a cognitive comparison between anticipated satisfaction (Expectations) and received satisfaction (Perceptions) (Howard & Sheth, 1969). This approach is based on Disconfirmation theory which relies on the confirmation of expectations by three possible levels (equal, negative, and positive). Staples, Wong, and Seddon (2002) applied Disconfirmation theory in information systems and they showed that perceived net benefit of a system is influenced by the unrealistically high expectations. An application of pre-post comparisons have been presented and pointed out that the actual experience had a positive influence on attitudes toward CBA (Deutsch, Herrmann, Frese, & Sandholzer, 2012). Thus, in this study we use the following equation:

Confirmation (C) = Perception (P)−Expectation (E).

This equation could be applied in any variable that is an output of interaction between user and system such as Perceived Playfulness, Perceived Ease of Use and Perceived Usefulness. Accordingly, the equation regarding the aforementioned variables alters to:

Confirmed Playfulness = Perceived Playfulness−Expected Playfulness.
Confirmed Usefulness = Perceived Usefulness−Expected Usefulness.
Confirmed Ease of Use = Perceived Ease of Use−Expected Ease of Use.
Confirmed Content = Perceived Content−Expected Content.
Confirmed Facilitating Conditions = Perceived Facilitating Conditions−Expected Facilitating Conditions.
Confirmed Goal = Perceived Goal−Expected Goal.

3.2. Research model and hypotheses

3.2.1. Confirmed Playfulness

Confirmed Playfulness (CP) is the difference between Perceived Playfulness and Expected Playfulness.

Concentration, Curiosity and Enjoyment are the three dimensions that define Perceived Playfulness. Perceived Playfulness measures if the interaction with the system stimulates user's concentration, user's cognitive curiosity (Malone, 1981a, 1981b, pp. 258–276) and user's enjoyment. Moon and Kim (2001) extended TAM by adding Perceived Playfulness based on Csikszentimihalyi's (1975) and Deci and Ryan (1985) works. Regarding continuance intention to use Perceived Playfulness extends ECM (Lin et al., 2005). Moreover, Perceived Playfulness has a positive effect on the behavioral intention to use a CBA (Terzis & Economides, 2011a).

On the other hand, Expected Playfulness is formulated based on learner's prior uses on similar systems and/or others' opinions such as their seniors, colleagues and teachers regarding the potential playfulness of the system.

Since, Perceived Playfulness affects behavioral intention to use, we believe that Confirmed Playfulness (CP) will also affect continuance intention to use a CBA. Thus, we hypothesized:

H1. Confirmed Playfulness will have a positive effect on Continuance Intention to Use.

3.2.2. Confirmed Usefulness

Confirmed Usefulness (CU) is the difference between Perceived Usefulness and Expected Usefulness. Perceived Usefulness is a person's beliefs that a system will enhance his/her job performance (Davis, 1989). Previous studies have supported that Perceived Usefulness has a direct effect on behavioral intention to use an LMS (e.g. Lee, 2008; Ong & Lai, 2006; Van Raaij & Schepers, 2008) and an indirect effect through Perceived Playfulness on CBA systems (Terzis & Economides, 2011a). Perceived Usefulness demonstrated also a strong effect on continuance intention to use (Bhattacherjee, 2001a; Lin et al., 2005).

Expected Usefulness is defined as user's expectations that using CBA will enhance his/her academic performance.

Therefore, if user's perceptions are higher than his/her expectations regarding Usefulness, this difference will have a positive effect on Confirmed Playfulness and on Continuance Intention to Use.

H2. Confirmed Usefulness will have a positive effect on Continuance Intention to Use.

H3. Confirmed Usefulness will have a positive effect on Confirmed Playfulness.

3.2.3. Confirmed Ease of Use

Confirmed Ease of Use (CEOU) is the difference between Perceived Ease of Use and Expected Ease of Use. Perceived Ease of Use measured user's perceptions regarding the effort that he/she spends in order to be capable to use the system (Davis, 1989). Previous studies showed a direct effect of Perceived Ease of Use on Perceived Usefulness, Perceived Playfulness and on Behavioral Intention (Agarwal & Prasad, 1999; Hu, Chau, Sheng, & Tam, 1999; Terzis & Economides, 2011a; Venkatesh, 1999; Venkatesh & Davis, 1996).

On the other hand, probably learners had already used a similar platform in their schools or an educational computer game. Based on these previous experiences, they will have a specific level of expectations regarding CBA's ease of use, which is measured through Expected Ease of Use. We assume that Confirmed Ease of Use will enhance Confirmed Playfulness, Confirmed Usefulness and Continuance Intention.

H4. Confirmed Ease of Use will have a positive effect on Continuance Intention to use CBA.

H5. Confirmed Ease of Use will have a positive effect on Confirmed Usefulness.

H6. Confirmed Ease of Use will have a positive effect on Confirmed Playfulness.

3.2.4. Confirmed Facilitating Conditions

Learners expected facilities by the system or by the faculty during CBA. Learners might confront some difficulties regarding the system's operation or the questions' content. System's tools or faculty's help are the Facilitating Conditions that will help learner to overcome these situations. The importance of Facilitating Conditions was also studied in other contexts (Bueno & Salmeron, 2008; Lu, Liu, Yu, & Wang, 2008). Regarding CBA, it has been suggested that Facilitating Conditions determine Perceived Ease of Use (Terzis & Economides, 2011a).

Confirmed Facilitating Conditions (CFC) is the difference between the Expected Facilitating Conditions and the facilitating conditions that learners experienced during CBA. So, we hypothesized a positive effect of CFC on CEOU.

H7. Confirmed Facilitating Conditions will have a positive effect on Confirmed Ease of Use.

3.2.5. Confirmed Goal

In LMS and CBAs, learners have to be self-directed and goal oriented in order to benefit from their interaction with these systems (Shih, 2008; Smith, Murphy, & Mahoney, 2003; Terzis & Economides, 2011a; Yi & Hwang, 2003). In our experiment, learner formulated an Expected Goal, based on his/her preparation and course's difficulties. Confirmed Goal (CG) is the difference of the Expected Goal and the actual goal (score) that they succeeded. Previous studies showed that in a summative assessment Goal Expectancy had positive effect on Perceived Usefulness and Perceived Playfulness (Terzis & Economides, 2011a). Correspondingly, we believe that a positive value of Confirmed Goal (actual goal $>$ expected goal) will have a positive influence on Confirmed Usefulness and Confirmed Playfulness. Thus, we hypothesized:

H8. Confirmed Goal will have a positive effect on Confirmed Usefulness.

H9. Confirmed Goal will have a positive effect on Confirmed Playfulness.

3.2.6. Confirmed Content

Content is a very important variable regarding learner's satisfaction (Wang, 2003). Thus, LMS and CBAs have to be delivered with useful and sufficient content. Course's content and questions during CBA describe Content variable (Terzis & Economides, 2011a, 2011b). Course's content is actually measured by learner's evaluation regarding the difficulty, usefulness or interest of the course. Thus, course's content affects learner's view regarding CBA. Moreover, some features of the questions during CBA like clearness, comprehension and relevance might affect learner's opinion regarding the usefulness and the playfulness of the CBA and consequently learner's behavioral intention to use CBA in the future.

Learners, based on course's content and similar CBAs, formulate expectations regarding CBA's content before they use it. After the interaction with the CBA, learners evaluated the Content. The difference between the Expected Content and the Perceived Content is the Confirmed Content.

Table 1
Pre and post questionnaires.

Time1: before assessment	Time2: after assessment	Confirmed = Time2–Time1
Expected Playfulness (EP)	*Perceived Playfulness (PP)*	*Confirmed Playfulness (CP)*
EP1: I expect that the use of the CBA will keep me happy for my task.	PP1: Using CBA keeps me happy for my task.	CP1 = PP1–EP1
EP2: I expect that the use of the CBA will give me enjoyment for my learning.	PP2: Using CBA gives me enjoyment for my learning.	CP2 = PP2–EP2
EP3: I expect that the use of the CBA will stimulate my curiosity.	PP3: Using CBA, my curiosity is stimulated.	CP3 = PP3–EP3
EP4: Using CBA will lead to my exploration.	PP4: Using CBA will lead to my exploration.	CP4 = PP4–EP4
Expected Usefulness (EU)	*Perceived Usefulness (PU)*	*Confirmed Usefulness (CU)*
EU1: Using the Computer Based Assessment (CBA) I expect to improve my work.	PU1: Using the Computer Based Assessment (CBA) will improve my work.	CU1 = PU1–EU1
EU2: Using the Computer Based Assessment (CBA) I expect to enhance my effectiveness.	PU2: Using the Computer Based Assessment (CBA) will enhance my effectiveness.	CU2 = PU2–EU2
EU3: Using the Computer Based Assessment (CBA) I expect to increase my productivity.	PU3: Using the Computer Based Assessment (CBA) will increase my productivity.	CU3 = PU3–EU3
Expected Ease of Use (EEOU)	*Perceived Ease of Use (PEOU)*	*Confirmed Ease of Use (CEOU)*
EEOU1: I expect that my interaction with the system will be clear and understandable.	PEOU1: My interaction with the system is clear and understandable.	CEOU1 = PEOU1–EEOU1
EEOU2: I expect that it will be easy for me to become skillful in using the system.	PEOU2: It is easy for me to become skillful in using the system.	CEOU2 = PEOU2–EEOU2
EEOU3: I expect to find the system easy to use.	PEOU3: I find the system easy to use.	CEOU3 = PEOU3–EEOU3
Expected Facilitating Conditions (EFC)	*Perceived Facilitating Conditions (PFC)*	*Confirmed Facilitating Conditions (CFC)*
EFC1: I expect someone to help me when I will need help to use the CBA.	PFC1: When I need help to use the CBA, someone is there to help me.	CFC1 = PFC1–EFC1
EFC2: I expect to be supported by system's help when I will need help to use the CBA.	PFC2: When I need help to learn to use the CBA, system's help support is there to teach me.	CFC2 = PFC2–EFC2
Expected Goal (EG)	*Perceived Goal (PG)*	*Confirmed Goal (CG)*
EG1: How many questions do you believe that you will answer correctly?	PG1: the actual amount of correct answers	CG1 = PG1–EG1
Expected Content (EC)	*Perceived Content (PC)*	*Confirmed Content (CC)*
EC1: I expect that CBA's questions will be clear and understandable.	PC1: CBA's questions were clear and understandable.	CC1 = PC1–EC1
EC2: I expect that CBA's questions will be easy to answer.	PC2: CBA's questions were easy to answer.	CC2 = PC2–EC2
EC3: I expect that CBA's questions will be relative to the course's syllabus.	PC3: CBA's questions were relative to the course's syllabus.	CC3 = PC3–EC3
EC4: I expect that CBA's questions will be useful for my course.	PC4: CBA's questions were useful for my course.	CC4 = PC4–EC4
Expected Behavioral Intention to use CBA (EBI)	*Perceived Behavioral Intention to use CBA (PBI)*	*Continuance Behavioral Intention to use CBA (CBI)*
EBI1: I intend to use CBAs in the future.	PBI1: I intend to use the CBA in the future.	CBI1 = PBI1–EBI1
EBI2: I predict I would use CBAs in the future.	PBI2: I predict I would use the CBA in the future.	CBI2 = PBI2–EBI2
EBI3: I plan to use CBAs in the future.	PBI3: I plan to use the CBA in the future.	CBI3 = PBI3–EBI3

Previous results showed that Content affects Perceived Usefulness and Perceived Playfulness, Goal Expectancy and indirectly behavioral intention (Terzis & Economides, 2011a). Thus, we expected that:

H10. Confirmed Content will have a positive effect on Confirmed Usefulness.

H11. Confirmed Content will have a positive effect on Confirmed Playfulness.

H12. Confirmed Content will have a positive effect on Confirmed Goal.

H13. Confirmed Content will have a positive effect on Continuance Intention to use CBA.

4. Methodology

4.1. Research participants and data collection

CBA was applied in order to support learners in an introductory informatics course, in the Department of Economic Sciences of a Greek University. Course's syllabus included general concepts of ICT and the use of Word Processing and Internet. CBA's questions were based on course's syllabus. The use of the CBA was voluntary. 119 first-year students out of 320 (36%) took the advantage to use the CBA. However, 116 students answered the questionnaires that we are using in our analysis. 45 (39%) were males and 71 (61%) were females. Moreover, the sample had high computer self-efficacy with mean = 5.33 and SD = 1 on the scale of 1–7. The average age of the students was 18.5 (SD = 1.03).

At the beginning of the assessment, the CBA system asked students how many correct answers would make them feel satisfied by the level of their knowledge, making them set their personal goal. Each student had to answer 45 multiple choice questions in 45 min. The questions appeared randomly, one at a time. A student selected his/her answer among four possible answers and confirmed his/her choice by clicking the 'submit' button to proceed to the next question.

Our acceptance model does not include system's design and aesthetics, therefore CBA's appearance and use was very simple. An online Multiple Choice Questions (MCQ) test system, built for a previous experiment (Moridis & Economides, 2009), was adjusted to serve the needs of the current study.

Students answered a questionnaire survey based on CBAAM before and after using the CBA system. Each questionnaire consists of 20 items in order to measure the 7 latent variables (Table 1). We used the seven point Likert-type scale with 1 = strongly disagree to 7 = strongly agree, in order to measure the items. Pre and Post answers were used in order to estimate the Confirmed Variables as Table 1 displays.

4.2. Data analysis

This study uses the technique of partial least-squares (PLS) analysis in order to estimate the measurement and the structural model. PLS was preferred than Structural Equation Modeling (SEM) techniques, since our sample is small and PLS requirements are more tolerant. Specifically, the sample size has to be higher than the larger of the two following rules: (a) 10 times larger than the number of items for the most complex construct; (b) 10 times the largest number of independent variables impact a dependent variable (Chin, 1998). Regarding the first rule the most complex construct has 4 items (e.g. Content), while for the second rule 4 independent variables impact Behavioral Intention. Thus, the minimum recommended value regarding sample size is 40, which is surpassed from our sample (116).

Measurement model's reliability and validity are supported by the following criteria: (a) Items' factor loadings on the corresponded constructs have to be higher than 0.7; (b) Average Variance Extracted (AVE) have to be higher than 0.5 and the AVE's squared root of each variable has to be higher than its correlations with the other constructs (Barclay, Higgins, & Thompson, 1995; Chin, 1998; Fornell & Larcker, 1981); (c) Cronbach's a and composite reliability have to be greater than 0.7.

Structural model and hypotheses are supported by: (a) the variance measured (R^2) by the antecedent constructs. Values of 0.2, 0.13 and 0.26 are considered as small, medium and large variance respectively; (b) the value and the significance (t-values) of path coefficients and total effects. Bootstrapping procedure is applied to measure t-values.

Finally an overall goodness-of-fit criterion called GoF (Goodness of Fit) provides an overall prediction performance of the model by taking into consideration the measurement and the structural model (Tenenhaus, Amato, & Esposito Vinzi, 2004). The GoF is actually the geometric mean of the average communality in the measurement model (AVE) and the average R^2 of the endogenous variables. Values of 0.1, 0.25 and

Table 2
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]
Confirmed Playfulness	0.32	1.22		0.76	0.85	0.59
CP1			0.71			
CP2			0.82			
CP3			0.80			
CP4			0.74			
Confirmed Usefulness	−0.49	1.27		0.78	0.87	0.69
CU1			0.85			
CU2			0.85			
CU3			0.79			
Confirmed Ease of Use	0.51	1.32		0.74	0.85	0.66
CEOU1			0.80			
CEOU2			0.87			
CEOU3			0.76			
Confirmed Facilitating Conditions	0.74	1.18		0.73	0.88	0.78
CFC1			0.83			
CFC2			0.94			
Confirmed Goal	−0.23	0.47		1	1	1
CG1			1			
Confirmed Content	0.12	1.30		0.84	0.89	0.67
CC1			0.89			
CC2			0.81			
CC3			0.75			
CC4			0.84			
Continuance Behavioral Intention	0.08	1.28		0.83	0.90	0.74
CBI1			0.88			
CBI2			0.84			
CBI3			0.88			

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

Table 3
Discriminant validity for the measurement model.

Construct	CP	CU	CEOU	CFC	CG	CC	CBI
CP	0.77						
CU	0.46	0.83					
CEOU	0.31	0.47	0.81				
CFC	0.20	0.18	0.43	0.88			
CG	0.35	0.53	0.30	0.04	1		
CC	0.54	0.48	0.59	0.47	0.35	0.82	
CBI	0.52	0.26	0.39	0.24	0.20	0.40	0.86

0.36 are considered as small, medium and large respectively. The software that we used to estimate the measurement and the structural model was SmartPLS 2.0 (Ringle, Wende, & Will, 2005).

5. Results

Table 2 shows the item's factor loadings, the AVE, the Cronbach's *a* and the composite reliability. Table 3 displays the correlations among the constructs and the AVE of each construct. Results support the validity and the reliability of the measurement model.

Tables 4 and 5 and Fig. 2 display the results regarding the hypotheses, the variance measured (R^2) and the total effects. Regarding Continuance Behavioral Intention, we find a direct positive effect of Confirmed Playfulness and Confirmed Ease of Use. Confirmed Content is also a strong indirect determinant of Confirmed Behavioral Intention to Use through Confirmed Playfulness. The direct effect of Confirmed Usefulness and the indirect effects of Confirmed Goal and Confirmed Facilitating Conditions to Confirmed Behavioral Intention to Use did not confirm.

Moreover, the analysis shows that Confirmed Playfulness is determined directly by Confirmed Usefulness and Confirmed Content, and indirectly by Confirmed Goal. The direct effect of Confirmed Ease of Use on Confirmed Playfulness is not significant. Confirmed Usefulness is significantly attributed to Confirmed Ease of Use, Confirmed Goal, Confirmed Facilitating Conditions and Confirmed Content. Furthermore, Confirmed Content and Confirmed Facilitating Conditions have a direct positive effect on Confirmed Goal and Confirmed Ease of Use respectively.

In addition to path coefficients, structural model analysis includes the variance measured (R^2) of dependent variables by the antecedent constructs. The model explains the 34% of the variance in Confirmed Behavioral Intention to use. Based on the aforementioned criteria this value is considered as large since it is higher than 0.26. Furthermore, the antecedent constructs of Confirmed Playfulness and Confirmed Usefulness explain 35% and 42% of the variance respectively.

Finally, Regarding the Goodness of fit (GoF) criteria, the model's GoF value equals with 0.46. Since the value is larger than 0.36, the research model has a good fit.

6. Discussions

This study aims to investigate the determinants regarding continuance acceptance in CBA context. The study was relied on the hypothesis that a user will continue to intend to use a CBA on the fact that his expectations will be satisfied by the interaction with the system.

Results showed Confirmed Playfulness as the strongest direct predictor of Continuance Intention, followed by Confirmed Ease of Use. This means that if the user expectations regarding playfulness and ease of use are confirmed, it would be more likely to continue to use it. Therefore, CBA systems have to satisfy student's playfulness every time that they interact. This parameter can be achieved with systems that are frequently updated with new questions or new ways of interactions such as different kind of questions, aesthetics, and other add-ins. The renewal of the system with new versions and new add-ins ensures the satisfaction of playfulness. However, system updates have to be applied very carefully, because the abrupt changes in core settings of the system could frustrate and confuse the students.

Table 4
Hypothesis testing results.

Hypothesis	Path	Path coefficient	*t* value	Results
H1	CP → CBI	0.46**	5.33	Support
H2	CU → CBI	−0.10	0.95	Not support
H3	CU → CP	0.24*	2.33	Support
H4	CEOU → CBI	0.27*	2.16	Support
H5	CEOU → CU	0.24*	2.19	Support
H6	CEOU → CP	−0.08	0.67	Not support
H7	CFC → CEOU	0.43**	5.21	Support
H8	CG → CU	0.39**	4.51	Support
H9	CG → CP	0.10	1.16	Not support
H10	CC → CU	0.20*	2.14	Support
H11	CC → CP	0.44**	4.29	Support
H12	CC → CG	0.35**	4.85	Support
H13	CC → CBI	0.04	0.37	Not support

*$p < 0.05$, **$p < 0.01$.

Table 5
R^2 and direct, indirect and total effects.

Dependent variables	R^2	Independent variables	Direct effect	Indirect effect	Total effect
Continuance Behavioral Intention	0.34	Confirmed Playfulness	0.46	0.00	0.46***
		Confirmed Usefulness	−0.10	0.11	0.01^{ns}
		Confirmed Ease of Use	0.27	−0.04	0.23*
		Confirmed Facilitating Conditions	0.00	0.10	0.10^{ns}
		Confirmed Goal	0.00	0.05	0.05^{ns}
		Confirmed Content	0.04	0.23	0.27**
Confirmed Playfulness	0.35	Confirmed Usefulness	0.24	0.00	0.24**
		Confirmed Ease of Use	−0.08	0.05	−0.03^{ns}
		Confirmed Facilitating Conditions	0.00	−0.01	−0.01^{ns}
		Confirmed Goal	0.10	0.09	0.19**
		Confirmed Content	0.44	0.11	0.55***
Confirmed Usefulness	0.42	Confirmed Ease of Use	0.24	0.00	0.24**
		Confirmed Facilitating Conditions	0.00	0.10	0.10**
		Confirmed Goal	0.39	0.00	0.39***
		Confirmed Content	0.20	0.14	0.34***
Confirmed Ease Of Use	0.18	Confirmed Facilitating Conditions	0.43	0.00	0.43***
Confirmed Goal	0.12	Confirmed Content	0.35	0.00	0.35***

*$p < 0.1$, **$p < 0.05$, ***$p < 0.01$.

Furthermore, as we mentioned above, CBA systems have to satisfy ease of use. Confirmed Ease of Use is also a significant determinant of Confirmed Usefulness. Despite the fact that the direct effects of Ease of Use on Continuance Behavioral Intention and on Confirmed Usefulness are significant, we believe that Ease of Use is not a very important determinant of continuance acceptance because the direct effect on Confirmed Playfulness is not significant. This may be explained by the fact that a student or a user might find the CBA more playful if it is easy to use, however this condition is fading by the time the student learns to use the system and he/she does not find important anymore that the system is easy to use. In other words, one could suggest that ease of use is a system's parameter that could affect user's playfulness and intentions for limited time.

However, the results did not confirm previous studies on continuance acceptance regarding usefulness. This outcome could be explained by the fact that users' expectations regarding usefulness were not confirmed through the interaction with the system. Consequently, the unsatisfied usefulness of the system has a negative effect on continuance acceptance. Thus, we could assume that if users' Confirmed Usefulness is positive then the effect on Continuance Behavioral Intention could be significant.

We also hypothesized a direct positive effect of Confirmed Usefulness on Confirmed Playfulness. According to the results, this hypothesis is confirmed. This points out, that if students' expectations regarding CBA's usefulness are satisfied, then, it is more likely to find the CBA more playful than they expected.

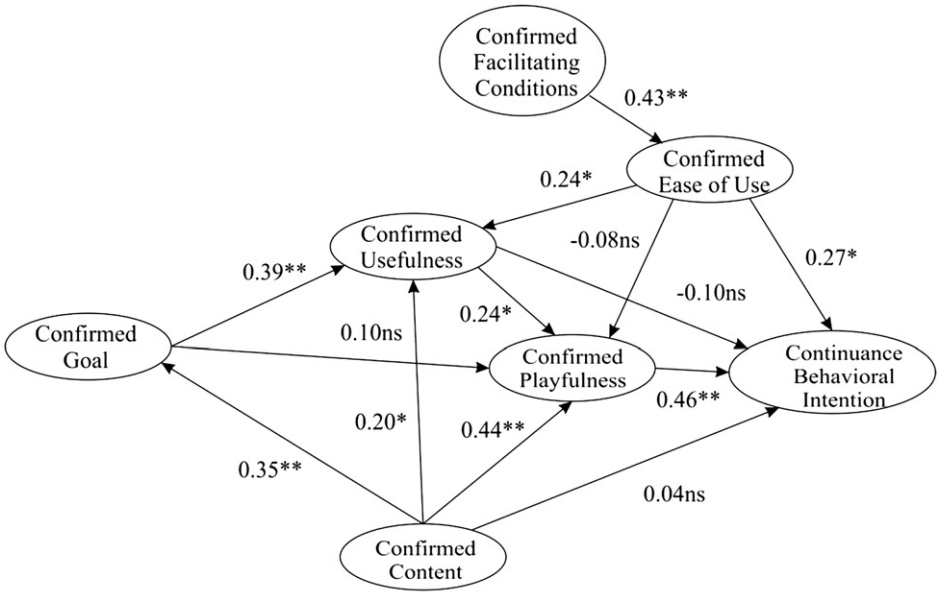

Fig. 2. The proposed model supported and not supported hypotheses.

The direct effect of Confirmed Content on Continuance Behavioral Intention was also not confirmed. Nevertheless, the total effect of Confirmed Content on Continuance Behavioral Intention mainly through Confirmed Playfulness was significant. This means that if CBA's questions are designed carefully and delivered properly to the students, they might find the CBA playful. This sequence will have a positive effect on student's continuance acceptance.

As we expected, Confirmed Content has also direct effects on Confirmed Usefulness and on Confirmed Goal. Thus, if student's expectations regarding content are satisfied, he/she will not find the CBA only more playful, but also more useful. Moreover, the content's confirmation affects goal confirmation. Thus, a student who is satisfied with CBA's content, he/she will probably have better results than he/she expected. This points out that if the content's characteristics match with students' preferences and ways of preparation and study, then it is more likely that he/she surpasses his/her goal.

Furthermore, results showed that Confirmed Goal has a significant direct positive effect on Confirmed Usefulness but not on Confirmed Playfulness. For Confirmed Usefulness, it means that a student who performed better than he/she expected, probably he/she finds the CBA more useful. This is explained by the fact that a student that he/she prepared properly, he/she might understand better CBA's questions and consequently he/she would find it more useful.

On the other hand, the direct positive effect of Confirmed Goal on Confirmed Playfulness was not confirmed. This might be explained by the low number of students that surpassed their expectations regarding their goals.

Thus, the results support that a student might find the CBA playful, but it is not necessary that he/she performed better than he/she expected. However, we assume that if the students performed better they might also find the CBA even more playful and in this case the positive effect of Confirmed Goal on Confirmed Playfulness would be significant. According to the results, students will be uninfluenced by their low grades regarding how much playful they find the CBA, however if they sustain to perform lower than their expectations, they might lose their temper and consequently their positive perceptions regarding CBA's playfulness.

Finally, Confirmed Facilitating Conditions have a direct positive effect on Confirmed Ease of Use. This means that if student's expectations regarding system's tools (e.g. help button) or the guidance by the academic staff are satisfied then it is more likely to find the system easier to use than they expected. Thus, a CBA must be designed with all the appropriate tools that will help a student find information or any kind of support that he/she will need if he/she uses it alone.

7. Conclusions

The aim of this paper was to examine the determinants of CBA Continuance Behavioral Intention. Previous studies on IS continuance acceptance highlighted Confirmation and Expectation as crucial determinants. Our study tried to integrate expectation, interaction (perception) and confirmation into one variable. This idea was realized through a questionnaire survey in two different times: 1) before the interaction with the CBA in order to measure student's expectations 2) after the interaction with the CBA in order to measure student's perceptions. The difference between student's perceptions and student's expectations is actually the level of confirmation. This approach was applied for all the crucial determinants regarding continuance acceptance such as Playfulness, Ease of Use, Usefulness, Content, Goal and Facilitating Conditions.

The main theoretical contribution of this study is that confirmation or disconfirmation of each important determinant of behavioral intention explains why students would like to continue to use the system. This points out that the level of students' expectations and the level of students' experience with the system are very essential for a successful implementation of a new CBA system. Therefore, tutors and practitioners should take into consideration this information by two ways: a) they should keep student's expectations regarding system's characteristics realistic; b) they should provide high quality CBA systems in order to maximize the satisfaction of student's experience with the CBA systems.

In addition, results indicate that confirmation or disconfirmation of each construct might explain the confirmation or disconfirmation of other important variables. Particularly, the results point out that Confirmed Playfulness and Confirmed Ease of Use have a significant direct effect on Continuance Behavioral Intention. In addition, Confirmed Content has a significant indirect effect on Continuance Behavioral Intention through Confirmed Playfulness. Except Confirmed Content, Confirmed Usefulness is also a strong determinant of Confirmed Playfulness. Furthermore, Confirmed Usefulness is significantly attributed to Confirmed Goal, Confirmed Content and Confirmed Ease of Use. Moreover, Confirmed Ease of Use is explained by Confirmed Facilitating Conditions.

Results underline Confirmed Playfulness as the most important determinant of continuance acceptance. Through Confirmed Playfulness all the other determinants influence Continuance Behavioral Intention. This means that if practitioners or educators provide a CBA system which satisfies student's expectations regarding usefulness and content, it will be more likely that students will find CBA system more playful.

This study faces some limitations which might have influenced the results. The first limitation is the relative small sample. A sample with more students might have supported the hypotheses that this study failed to confirm. Another limitation that emanates from the sample is that participants are first-year undergraduate students in an introductory course to informatics; therefore our results might be different if we applied the research in other groups with different characteristics such as age, specialization and nationality or to another course.

Moreover, we could argue that students found the questions quite difficult since most of them failed to reach their expectations; we assume that for that reason the direct effect of Confirmed Goal on Confirmed Playfulness was not confirmed. Our study focused only on variables that have to do with the user/system interaction, thus it lacks of other important constructs such as social influence which could help to explain better the continuance acceptance of CBA system. Moreover, the results would be more significant if the study had longitudinal data to more fully support the concept of continuance acceptance.

This study is a further step toward IS continuance acceptance delivered in CBA context. It isolates variables regarding user/system interaction. It firstly measures user's expectations before the interaction and secondly user's perceptions after the interaction. Through these measurements we are able to estimate student's level of confirmation for each variable. Finally, it figures out how these variables influence CBA continuance acceptance. Further studies have to be realized in order to examine the validity and the reliability of the approach and the results.

To conclude, this study contributes to CBA continuance acceptance research with the following ways: 1) it is the first research study regarding CBA continuance acceptance. 2) It introduces a new approach that integrates into one variable user's expectations and perceptions in order to express user's confirmation regarding crucial determinants of continuance acceptance. In addition, the results could also be applied in other research fields of IS continuance acceptance. Moreover, the results are helpful for practitioners and educators in design and adoption of a CBA system.

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