



Understanding e-learning continuance intention in the workplace: A self-determination theory perspective

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Abstract

Based on self-determination theory (SDT), this study proposed an extended Technology Acceptance Model (TAM) in the context of e-learning service. In the proposed model perceived usefulness, perceived playfulness and perceived ease of use are predicted to be influenced by perceived autonomy support, perceived competence and perceived relatedness. Although TAM has received fairly extensive attention in prior research, this study is one of the first to examine the effects of motivational factors affecting TAM constructs. The results show that applying SDT to e-learning in a work setting can be useful for predicting continuance intention.

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1. Introduction

Over the last years, Information Technology (IT) has provided several advantages for the business and social domains. Internet, and specially the World Wide Web, has become an essential tool for both fields. Users' acceptance is the most important determinant of

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continuance intentions when using any technology. We can find several theoretical models that were proposed to explain and predict individuals' attitudes and acceptance of Information Systems (IS). The most well-known are the Theory of Reasoned Action (TRA) (Ajzen & Fishbein, 1980; Fishbein & Ajzen, 1975) and its extension, Theory of Planned Behavior (TPB) (Ajzen, 1985, 1991), and the Technology Acceptance Model (TAM; Davis, 1989; Davis, Bagozzi, & Warshaw, 1989). These models have dominated the research on individual adoption of IS in organizations and have contributed great knowledge to this research issue. TAM, adapted from TRA, posits that the most important determinants of the individual's acceptance of IT are perceived usefulness and perceived ease of use.

In a later study, Davis, Bagozzi, and Warshaw (1992) introduced perceived enjoyment in the model as an intrinsic motivation and defined perceived usefulness as an extrinsic motivation. Other IS researchers have also distinguished the effects of extrinsic and intrinsic motivation on the individual's acceptance of IT (Agarwal & Karahanna, 2000; Igbaria, Parasuraman, & Baroudi, 1996; Shang, Chen, & Shen, 2005; Teo, Lim, & Lai, 1999; Venkatesh, 1999, 2000; Venkatesh & Speier, 1999). Recent findings in intrinsic motivation and self-efficacy research indicate that playfulness (Hsu & Chiu, 2004a; Liu & Arnett, 2000; Moon & Kim, 2001; Webster & Martocchio, 1992) and computer self-efficacy (Agarwal, Sambamurthy, & Stair, 2000; Chau, 2001; Compeau & Higgins, 1995; Venkatesh & Davis, 1996) also play important roles in determining a user's behavioral intention and actual usage.

Since perceived usefulness and perceived playfulness are motivational factors, we propose to introduce antecedent variables that are likely to have an influence on the type of motivation that e-learning users are likely to adopt and how these different types of motivation will influence intentions to continue using e-learning. That is, how do organizational factors such as supervisors support, top management support and work environment affect users' acceptance? A potentially useful theoretical framework for understanding these critical questions is self-determination theory (Deci & Ryan, 1985a, 1991, 2000), a theory of human motivation that proposes a multidimensional conceptualization of motivation and an associated model of individual and contextual antecedents. SDT distinguishes between different types of motivation based on the different regulations that give rise to an action.

This study contributes to the technology acceptance literature by examining the relationships between SDT and TAM variables in the same model. We propose to examine the effects of the motivational determinants on TAM constructs using SDT as the background theory. Thus, we introduce perceived autonomy, perceived competence and perceived relatedness as determinants of perceived usefulness, perceived playfulness and perceived ease of use.

2. Theoretical background and research model

2.1. Technology acceptance model

Davis adapted TAM from TRA to predict user's acceptance of IT and introduced two important constructs, perceived usefulness and perceived ease of use. Davis (1989, p. 320) defined perceived usefulness as "the degree to which a person believes that using a particular system would enhance his/her job performance". Perceived ease of use is defined as

“the degree to which a person believes that using a particular system would be free of physical and mental effort” Davis, 1989, p. 320. TAM posits that the most important determinant of the user’s behavioral intention and actual usage is attitude, which in turn is a combination of perceived usefulness and perceived ease of use. The causal relationships among these constructs have been validated empirically in many studies of user acceptance (Mathieson, 1991; Moon & Kim, 2001; Taylor & Todd, 1995a; Venkatesh, 2000; Venkatesh & Davis, 1996, 2000).

Davis et al. (1992) defined perceived enjoyment as “the extent to which the activity of using a computer system is perceived to be personally enjoyable in its own right aside from the instrumental value of the technology”. Webster and Martocchio (1992, p. 204) defined microcomputer playfulness as “the degree of cognitive spontaneity in microcomputer interactions”. Therefore, perceived usefulness is a form of extrinsic motivation and perceived enjoyment a form of intrinsic motivation. In this manner, researchers in IS have incorporated motivational factors to understand the external variables that influence the formation of attitudes and beliefs. Within SDT, the most basic distinction is between intrinsic motivation, which refers to doing something because it is inherently interesting or enjoyable, and extrinsic motivation, which refers to doing something because it leads to a separable outcome (Ryan & Deci, 2000).

Recent studies have begun to use these determinants to analyze users’ motivations to continue using IT (Moon & Kim, 2001; Shang et al., 2005; Teo et al., 1999; Venkatesh & Speier, 1999). Venkatesh and Speier (1999) conducted an experiment to determine how mood, during technology training, affected motivation. They found that there were only short term increases in intrinsic motivation and intention to use the technology among individuals in the positive mood intervention. In contrast, a long-term reduction of intrinsic motivation and intention was observed among those in the negative mood intervention. In a study of users’ motivations for the use of Internet, Teo et al. (1999) found that perceived usefulness exerted stronger effects on Internet usage than perceived ease of use. Moon and Kim (2001) introduced perceived playfulness as a new factor that reflects the user’s intrinsic motivation in World Wide Web acceptance.

Shang et al. (2005) integrated TAM with intrinsic and extrinsic motivations for consumers to shop on-line. They found that fashion and a cognitive absorption of experiences on the web played a significant role predicting on-line consumer behavior.

2.2. *Self-determination theory*

SDT proposes two overarching types of motivation. Intrinsic motivation refers to doing an activity for its own sake, because one enjoys the process (Ryan & Deci, 2000). Extrinsic motivation refers to doing an activity for a consequence separable from the activity itself, such as the pursuit of a reward or the avoidance of a punishment (Ryan & Deci, 2000). More than 30 years of research has shown that intrinsic motivation leads to better persistence, performance, and satisfaction in a variety of tasks in various domains (e.g., education, behavioral health, organizational) than extrinsic motivation (Baard, Deci, & Ryan, 2004; Black & Deci, 2000; Deci, Connell, & Ryan, 1989; Williams, Grow, Freedman, Ryan, & Deci, 1996). The theory also proposes that the adoption of intrinsic motivation over extrinsic motivation depends on the satisfaction of three basic psychological needs for autonomy, competence, and relatedness.

SDT focuses on motivations and proposes that human beings have basic psychological needs for autonomy, competence, and relatedness. Research has suggested that people are more likely to persist and have better qualitative performance on activities that satisfy these needs (LaGuardia, Ryan, Couchman, & Deci, 2000; Sheldon & Elliot, 1999; Vallerand, 1997). In SDT, autonomy concerns the desire to self-organize one's actions, when the individual can freely pursue the activity and feels volitional in doing so (Deci & Ryan, 1985a, 1987; Ryan & Connell, 1989). The need for competence implies that individuals tend to be effective in their interactions with the environments and when they perform an activity (Deci & Ryan, 1980, 1985a; Elliot & Thrash, 2002) which is similar to the concept of self-efficacy (Bandura, 1986). The need for relatedness (Baumeister & Leary, 1995; Ryan, 1993) is the need to feel connected and supported by important people, such as a manager, parents, teachers, or team-mates.

The satisfaction of the three basic psychological needs depends in big part on the context in which the activity takes place. Early research that has led to the development of cognitive evaluation theory (CET; Deci & Ryan, 1985a, 1991), a sub-theory of SDT, has shown that external controls, such as contingent rewards (Deci, 1971; Deci, Koestner, & Ryan, 1999), deadlines (Amabile, Dejong, & Lepper, 1976), surveillance, evaluation (Amabile, 1979; Harackiewicz, Manderlink, & Sansone, 1984), and threats (Deci & Cascio, 1972) can diminish people's intrinsic motivation (rated both in terms of time spent on the activity during a free choice period and in terms of self-reported interest in the task). The quality of interactions with significant others in the context of the activity can also influence the type of motivation adopted for this activity. Autonomy support is described as an interpersonal style where the influential person offers choices or options, take the motivatee's perspectives into account, provide relevant information and rationales for engaging in the activity, and encourage initiative (Deci, Nezlek, & Sheinman, 1981; Deci & Ryan, 1987, 1991; Deci et al., 2001; Deci, Schwartz, Sheinman, & Ryan, 1981; Koestner, Ryan, Bernieri, & Holt, 1984; Williams & Deci, 1998; Williams, Gagné, Ryan, & Deci, 2002; Zuckerman, Porac, Lathin, Smith, & Deci, 1978). Thus, when parents, teachers, trainers, or managers use a style characterized as autonomy-supportive, motivatees are more likely to become intrinsically motivated toward the activity (or maintain initial levels of intrinsic motivation). However, when these influential people act in a controlling way, the motivatee is likely to become more extrinsically motivated, with resulting consequences for persistence, performance, and satisfaction. Other research has shown that autonomy support leads to greater engagement in an initially uninteresting activity and increased positive feelings toward the activity (Black & Deci, 2000; Deci, Eghrari, Patrick, & Leone, 1994; Joussemet, Koestner, Leks, & Houliort, 2004).

But the most useful and innovative contribution of SDT is that it also proposes that extrinsic motivation need not be an invariably controlled form of motivation (Deci & Ryan, 1985a; Ryan & Connell, 1989). The theory proposes that it is possible to internalize extrinsic motivation, so that it can become autonomously regulated. Internalization is defined as taking in values, goals, and structures as one's own, so that a behavior becomes internally regulated as opposed to regulated by external factors like rewards and punishments. The theory specifies that the degree of internalization can make extrinsic motivation vary in terms of how autonomous it is. External regulation refers to doing an activity in order to obtain a reward or avoid a punishment. It is thus the prototype of controlled extrinsic motivation. Introjection refers to having taken in a value or structure but not having accepted it as one's own. Thus the introjected regulation of a behavior is char-

acterized by ego-involvement, feelings of internal pressure, guilt, and shame or by contingencies of self-worth. Identification refers to having taken in a value or regulation and accepting it as personally meaningful and important to oneself. Thus, the identified regulation of an activity is felt as being personally meaningful and as fulfilling important personal goals and values. Introjected regulation is a controlled form of regulation, just like external regulation, even though it is internal to the person (i.e. partly internalized), whereas identified regulation is an autonomous form of motivation, just like intrinsic motivation. The difference between identified regulation and intrinsic motivation is that with the former, people engage in a behavior for instrumental reasons (achieving a personal goal) whereas with the latter, people engage in a behavior out of enjoyment.

Relatedly, the IS literature clearly shows that for specific types of task, playfulness and usefulness have different effects. Usefulness has stronger effects for uninteresting tasks (Hsu & Chiu, 2004a, 2004b; Igarria, Schiffman, & Wieckowshi, 1994; Igarria, Iivari, & Maragahh, 1995), whereas playfulness has stronger effects in interesting tasks (Atkinson & Kydd, 1997; Childers, Carr, Peck, & Carson, 2001; Moon & Kim, 2001). If playfulness represents intrinsic motivation and usefulness represents identified motivation, these results make complete sense because Gagné and Deci (2005), based on past results showing that for uninteresting but relevant activities autonomous extrinsic motivation was a better predictor of behavioral engagement than intrinsic motivation, proposed that intrinsic motivation will predict engagement in interesting activities and identified motivation will predict engagement in uninteresting activities. For example, Pelletier, Tuson, Greene-Demers, Noels, and Beaton (1998) found that autonomous extrinsic motivation was more associated with pro-environmental behaviors than was intrinsic motivation. Also, Koestner, Losier, Vallerand, and Carducci (1996) found that intrinsic motivation was a potent predictor of people's engagement in politics through seeking information, whereas only identified motivation predicted actual voting behavior. In light of this, we could redefine the TAM constructs of perceived playfulness in intrinsic motivation terms, and perceived usefulness in identification terms (thus, an autonomous form of extrinsic motivation).

3. Development of the research model

Our model depicted in Fig. 1, based on SDT and TAM, holds that perceived autonomy support, perceived competence and perceived relatedness exert an important direct effect on perceived usefulness and perceived playfulness, which jointly with perceived ease of use are the most important antecedents of e-learning continuance intention.

3.1. *Perceived autonomy support*

Ryan and Deci (2000) suggest that social contextual conditions that support one's feelings of competence, autonomy, and relatedness are the basis for increasing intrinsic and extrinsic motivation, which in turn lead to greater performance. The relationship between autonomy and positive outcomes has been shown in a number of studies. In the work domain, Deci et al. (1989) found that autonomy support is a significant antecedent of trust in the organization, positive affect at work and work satisfaction. Deci et al. (2001) demonstrated that autonomy support in the job was significantly related with work engagement and well-being in a sample of Bulgarian and US workers. Gagné, Koestner, and

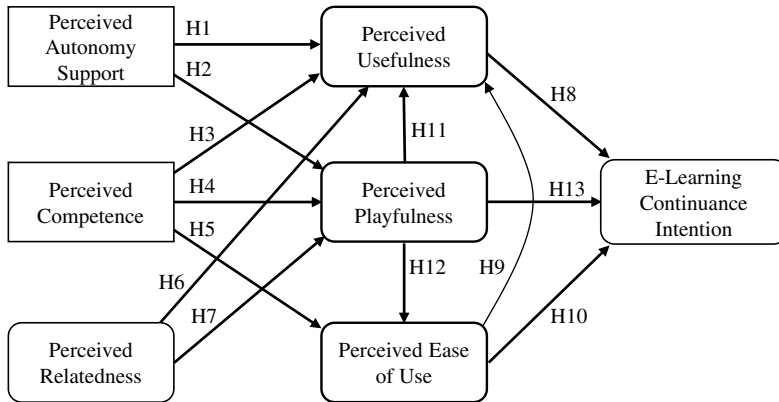


Fig. 1. Conceptual model.

Zuckerman (2000) also found that management autonomy support had a direct effect on acceptance of organizational change.

In the IS domain, the influence of management support in the adoption of IT has been found to be positively connected with system usage in prior studies. Karahanna and Straub (1999) proposed an explanation for the psychological origins of usefulness and ease of use. The results indicated that system use is affected through perceived usefulness and perceived ease of use by the degree of social influence exerted by supervisors. Igarria et al. (1996) indicated that organizational support had significant effects on usage of microcomputers. Igarria, Zinatelli, Cragg, and Cavaye (1997) found that internal management support and external support were significant predictors of perceived ease of use and perceived usefulness of systems, which in turn influenced personal computing acceptance in small firms.

In line with SDT, we predict that the contextual factor of autonomy support will increase perceived usefulness (i.e. extrinsic motivation) and perceived playfulness (i.e. intrinsic motivation). Therefore, we hypothesize:

H1: Perceived autonomy support has a positive effect on perceived usefulness.

H2: Perceived autonomy support has a positive effect on perceived playfulness.

3.2. Perceived competence

Bandura (1986) defined self-efficacy as “people’s judgments of their capabilities to organize and execute courses of action required to attain designated types of performances. It is concerned not with the skills one has but with the judgments of what one can do with whatever skills one possesses.” (p. 391). Self-efficacy, then, is an individual’s belief that he or she can perform a particular task or behavior and it is similar to the concept of competence within SDT. Further, some experiments showed that positive feedback improved intrinsic motivation relative to no feedback (Boggiano & Ruble, 1979) or even to negative feedback (Vallerand & Reid, 1984). In addition, CET specifies that feelings of competence will not enhance intrinsic motivation unless they are accompanied by a sense of autonomy (Fisher, 1978; Ryan & Deci, 2000). Nix, Ryan, Manly, and Deci (1999) showed that only

when people felt both competence and autonomous, successful performance improved intrinsic motivation.

In the IS literature, computer self-efficacy refers to self-assessment of individual ability to apply computer skills to complete the specified tasks (Compeau & Higgins, 1995). Thus, computer self-efficacy has been shown to influence perceived ease of use in prior studies (Agarwal et al., 2000; Chau, 2001; Venkatesh & Davis, 1996). Internet self-efficacy may be distinguished from computer self-efficacy as the belief that one can successfully perform a distinct set of behaviors required to establish, maintain and utilize effectively the Internet over and above basic personal computer skills (Eastin & LaRose, 2000). Computer self-efficacy was found to influence perceived usefulness in previous studies (Chau, 2001; Compeau & Higgins, 1995; Compeau, Higgins, & Huff, 1999). Since internet self-efficacy and computer self-efficacy are self-efficacy judgments, and previously computer self-efficacy and perceived ease of use have been found connected, we argue that it is reasonable to predict a relationship between internet self-efficacy and perceived ease of use. We hypothesize:

H3: Perceived competence has a positive effect on perceived usefulness of the e-learning system.

H4: Perceived competence has a positive effect on perceived playfulness of the e-learning system.

H5: Perceived competence has a positive effect on perceived ease of use of the e-learning system.

3.3. *Perceived relatedness*

SDT posits that the most significant antecedents of motivation are autonomy and competence although relatedness also plays an important role (Deci & Ryan, 2000). Deci and Ryan (2000) argue that when activities are not inherently interesting or enjoyable, the main reason why the people perform them is because they are valued by relevant others to whom they feel connected (i.e. family, peers or an organization). According to SDT, although autonomy and competence have a strong influence on motivation, people are likely to endorse their group's goals more when they feel connected to group members. Thus, when individuals are in an autonomy-supportive context and they have a sense of relatedness their motivation is enhanced (Ryan & Deci, 2000).

Therefore, perceived relatedness represents a form of social influence, in the IS domain, previous studies have assessed the social influence using subjective norm which is defined as "one's assessment of whether or not people important to him or her feel the behavior should be performed" (Ajzen, 1991). The influence of subjective norms has been tested on continuance intention (Bhattacharjee, 2000; Tan & Teo, 2000; Taylor & Todd, 1995a), perceived usefulness (Venkatesh & Davis, 2000), attitude (Hsu & Chiu, 2004a), and satisfaction (Hsu & Chiu, 2004b). Taylor and Todd (1995a) found that subjective norm was positively related to behavioral intention within the usage of a computing resource center for both experienced and inexperienced users. Bhattacharjee (2000) defined interpersonal influence as the "influence by friends, family members, colleagues, superiors, and experienced individuals known to the potential adopter" and external influence as the "influence by mass media reports, expert opinions, and other non-personal information considered by individuals in performing a behavior". Bhattacharjee (2000) modeled interpersonal

and external influences as subjective norm and found that both were significant predictors of intention to use electronic brokerage services.

Hsu and Chiu (2004a) found that subjective norms had significant effects on attitudes toward e-service usage. Tan and Teo (2000) found that subjective norm was not a significant antecedent of the individual's intention to adopt Internet banking. Hsu and Chiu (2004b) found that interpersonal influence exerts a stronger effect on satisfaction than external influence. In the present context this means that perceived relatedness should be positively related to perceived usefulness and perceived playfulness. Furthermore, Venkatesh and Davis (2000) found that subjective norm significantly influenced perceived usefulness. Therefore, the following hypothesis is proposed:

H6: Perceived relatedness has a positive effect on perceived usefulness of the e-learning system.

H7: Perceived relatedness has a positive effect on perceived playfulness of the e-learning system.

3.4. *Perceived usefulness*

Researchers (Davis et al., 1989; Venkatesh, 1999; Venkatesh & Davis, 1996, 2000) have empirically tested the positive relationship between perceived usefulness and behavioral intention to use. Therefore, we hypothesize:

H8: Perceived usefulness has a positive effect on behavioral intention to use the e-learning system.

3.5. *Perceived ease of use*

Previous research has shown that perceived ease of use has a significant effect on behavioral intention to use (Davis et al., 1989; Venkatesh & Davis, 1996, 2000). Additionally, a number of studies have found that perceived ease of use has significant effects on perceived usefulness (Davis, 1989; Davis et al., 1989; Mathieson, 1991; Taylor & Todd, 1995a, 1995b; Venkatesh & Davis, 1996, 2000). Therefore, we hypothesize:

H9: Perceived ease of use has a positive effect on perceived usefulness.

H10: Perceived ease of use has a positive effect on behavioral intention to use the e-learning system.

3.6. *Perceived playfulness*

Prior research has studied the impact of cognitive absorption, similar to perceived playfulness in our model, on perceived usefulness and perceived ease of use. In the World Wide Web context, Agarwal and Karahanna (2000) found that cognitive absorption had a significant effect on perceived usefulness and perceived ease of use. Saadé and Bahli (2005) applied TAM, including cognitive absorption, in an empirical study to explain the acceptance of Internet-based learning systems. The results suggested that cognitive absorption was a stronger predictor of perceived usefulness than of perceived ease of use. In a study of determinants of on-line shopping, Shang et al. (2005) also found a positive relationship

between these constructs. Venkatesh (2000) showed that playfulness was related to perceived ease of use. Moon and Kim (2001) found support for perceived playfulness as a significant determinant of behavioral intention. Therefore, we hypothesize:

H11: Perceived playfulness has a positive effect on perceived usefulness.

H12: Perceived playfulness has a positive effect on perceived ease of use.

H13: Perceived playfulness has a positive effect on behavioral intention to use the e-learning system.

4. Methodology

4.1. Data collection

The data used to test the research model were obtained from workers of four international agencies of United Nations: International Labour Organization (ILO), United Nations Educational, Scientific and Cultural Organization (UNESCO), United Nations Development Programme (UNDP), Office of the United Nations High Commissioner for Human Rights (OHCDH). An English version of the questionnaire was designed to be placed as Web-based survey on the Huelva University Website. Web-based surveys have been used in previous studies (Harp & Mayer, 1997; Negash, Ryan, & Igbaria, 2003; Teo et al., 1999). The link to the online survey was sent by e-mail to a total of 480 workers who at least took one e-learning course offered by United Nations System Staff College (UNSSC). UNSSC offers the opportunity to participate in courses to workers of some agencies in a specific region of the globe, usually made up of three or four countries. The aim of the training is to build institutional capacity by significantly improving professional and analytical skills and awareness of United Nations staff and its partners in the area of early warning and preventive measures. Since the number of participants is limited to 30 for each course, the managers of the agencies select workers that have requested voluntarily to participate in the course. The duration of each course is three weeks, and during this period the worker takes the course during working hours. Because the workers are selected to participate in the course by their supervisors, the support of managers is essential for the worker's participation. The support of co-workers is also important since they have to cover for tasks that the e-learner has been assigned during the period that the course lasts.

We received a total of 174 responses (including 73 men and 101 women). Since eight questionnaires were incomplete, a total of 166 usable surveys were used, for a net response rate of 34.5%. The respondents averaged 35.8 years in age and 48.3% had completed one college or university degree and 21.6% had completed postgraduate degrees.

4.2. Measures

The measures used in this article were mainly adapted from relevant prior studies.

Perceived autonomy support. Ten items consisting of three subscales from the first two sections of the Work Climate Survey developed by Deci et al. (1989), previously adapted from the Job Diagnostic Survey (Hackman & Oldham, 1975), were used to assess the workers' perceptions of work autonomy support. The Work Climate Survey has been validated in prior studies (Baard et al., 2004; Deci et al., 1989, 2001; Gagné, 2003). Workers

indicated on seven-point Likert scales the extent to which supervisors (3 items; $\alpha = 0.81$), top management (3 items; $\alpha = 0.78$) and the environment (4 items; $\alpha = 0.84$) are autonomy-supportive. Sample items included “My supervisor gives me a great deal of choice about how to do my job and how to handle problems I encounter” (supervisor autonomy support), “The decisions made by the top manager give little consideration to the workers situation” (management autonomy support). The subscale of environment autonomy support consisted of four adjectives describing the work atmosphere (e.g., “Cooperative”). Since the size of the sample was small to test the model, the scores of supervisor autonomy support, top management autonomy support and environment autonomy support were averaged to form a single observed variable perceived autonomy support. This method was used in a number of previous studies (e.g., Gagné, 2003).

Perceived competence. Thirteen items assessed workers’ feelings of competence using a computer or Internet. For computer self-efficacy ($\alpha = 0.86$) were included four items adapted from Compeau and Higgins (1995). We selected nine items ($\alpha = 0.83$) from General Internet Self-efficacy from Hsu and Chiu (2004a), who previously adapted from the Torkzadeh and Van Dyke’s Internet Self-efficacy Instrument (Torkzadeh & Van Dyke, 2001). Example items are as follows: for computer self-efficacy, “I could complete my learning activities using the e-learning system if I had never used a system like it before”; and for internet self-efficacy, “I feel confident in navigating the e-learning system by following hyperlinks”. The scales of internet self-efficacy and computer self-efficacy were also averaged to create a observed variable labeled perceived competence. For the next variables, we used the items as indicators on their respective latent factor.

Perceived relatedness. Eight items for perceived relatedness ($\alpha = 0.77$) were selected from the Basic Need Satisfaction at Work Scale (Ilardi, Leone, Kasser, & Ryan, 1993), which was used in prior studies (Deci et al., 2001; Gagné, 2003). Sample items included “I get along with people at work (reverse)”.

Perceived usefulness and perceived ease of use. Items for perceived usefulness (3 items; $\alpha = 0.78$) and perceived ease of use (3 items; $\alpha = 0.82$) were adapted from prior work by Davis (1989).

Perceived playfulness. Items for perceived playfulness (6 items; $\alpha = 0.89$) were adapted from Agarwal and Karahanna (2000).

Continuance intention. Items measuring continuance intention (3 items; $\alpha = 0.76$) were adapted from prior work by Mathieson (1991) and Bhattacharjee (2001). Sample items are as follows: for usefulness, “Using the e-learning service can improve my learning performance”; for ease of use, “Learning to operate the e-learning service is easy for me”; for playfulness, “I enjoy using the e-learning system”; and for continuance intention, “I will use the e-learning system on a regular basis in the future”.

4.3. Data analysis

The reliability and validity of the measurement instrument was evaluated using reliability and convergent validity criteria. Reliability of the survey instrument was established by calculating Cronbach’s alpha to measure internal consistency. As shown above, all values had an acceptable level of internal consistency ($\alpha \geq 0.7$). We also examined the convergent and discriminant validity of the model using the procedure outlined by Fornell and Larcker (1981). In terms of convergent validity, all items showed factor loadings higher than 0.7. For satisfactory discriminant validity, the square root of the average variance

Table 1
Correlations of latent variables

Construct	Mean (SD)	CINT	PEOU	PPL	PU	CSE	ISE	PC	SAS	MAS	ES	PAS	PR
CINT	6.23 (0.93)	0.83 ^a											
PEOU	5.86 (1.16)	0.380 ^{**}	0.79										
PPL	4.99 (0.89)	0.413 ^{**}	0.622 ^{**}	0.75									
PU	6.16 (1.08)	0.336 ^{**}	0.550 ^{**}	0.474 ^{**}	0.77								
CSE	4.70 (0.98)	0.681 ^{**}	0.369 ^{**}	0.015	0.128 ^{**}	0.80							
ISE	6.18 (1.06)	0.579 [*]	0.432 ^{**}	0.195 ^{**}	0.118 [*]	0.054	0.76						
PC	5.44 (0.74)	0.373 ^{**}	0.211 ^{**}	0.369 ^{**}	0.856 ^{**}	0.492 ^{**}	0.438 ^{**}	-					
SAS	5.67 (0.98)	0.663 [*]	0.337 ^{**}	0.235 ^{**}	0.085	0.431 ^{**}	0.661 [*]	0.215 [*]	0.81				
MAS	5.82 (0.92)	0.405 ^{**}	0.260 ^{**}	0.607 [*]	0.183 ^{**}	0.294 ^{**}	0.246 ^{**}	0.105 ^{**}	0.387 ^{**}	0.73			
ES	5.80 (1.12)	0.672 ^{**}	0.524 [*]	0.055	0.444 ^{**}	0.122 ^{**}	0.379 ^{**}	0.312 [*]	0.434 ^{**}	0.173 [*]	0.79		
PAS	5.76 (0.75)	0.102	0.213 [*]	0.540 [*]	0.410 ^{**}	0.386 ^{**}	0.252 [*]	0.243 ^{**}	0.176 ^{**}	0.275 ^{**}	0.383 ^{**}	-	
PR	5.82 (1.02)	0.299 [*]	0.517 ^{**}	0.068	0.178 ^{**}	0.367 [*]	0.624 [*]	0.187 [*]	0.425 ^{**}	0.217 ^{**}	0.419 ^{**}	0.425 [*]	0.84

^a Diagonal elements are the square root of Average Variance Extracted. These values should exceed the inter-construct correlations for adequate discriminant validity. CINT = Continuance intention; PEOU = Perceived Ease of use; PPL = Perceived playfulness; PU = Perceived usefulness; CSE = Computer self-efficacy; ISE = Internet self-efficacy; PC: Perceived competence; SAS = Supervisor autonomy support; MAS = Management autonomy support; ES = Environment support; PAS = Perceived autonomy support; PR = Perceived relatedness.

^{*} $p < 0.05$.

^{**} $p < 0.01$.

extracted (AVE) from the construct should be greater than the correlation shared between the construct and other constructs in the model (Fornell & Larcker, 1981). As shown in Table 1, the square root of the AVE is much larger than all other cross-correlations for the sample.

The full model of hypothesized relationships was statistically tested using LISREL 8.51, a software package designed to perform structural equations model approach to path analysis, using maximum likelihood estimation.

The hypothesized model fit the observed data adequately. Indices of fit provided for LISREL are the chi-square test statistic, the goodness of fit index (GFI), the root mean square error of approximation (RMSEA), the normed fit index (NFI), the non-normed fit index (NNFI), and the comparative fit index (CFI). The overall model fit the data well, $\chi^2(215) = 241.071$, ns, NFI = 0.96, NNFI = 0.95, GFI = 0.98, RMSEA = 0.06, CFI = 0.91.

The standardized path coefficients for the research model are presented in Fig. 2. Consistent with H1–H2, perceived autonomy support was positively related to perceived usefulness and perceived playfulness ($\gamma = 0.23$, $p < 0.05$; $\gamma = 0.36$, $p < 0.01$, respectively) and also had an indirect effect on continuance intention (0.08, $p < 0.05$).

As expected, hypotheses 3–5 were supported, perceived competence was related positively to perceived usefulness, perceived playfulness and perceived ease of use ($\gamma = 0.13$, $p < 0.01$, $\gamma = 0.19$, $p < 0.05$, $\gamma = 0.29$, $p < 0.01$, respectively). Furthermore, the indirect effect of perceived competence on continuance intention was also significant (0.04, $p < 0.05$).

Inconsistent with Hypothesis 6, the path from perceived relatedness to perceived usefulness was not significant ($\gamma = 0.07$, ns). As hypothesized, perceived relatedness was positively related to perceived playfulness ($\gamma = 0.12$, $p < 0.01$) and the indirect effect of perceived relatedness on continuance intention was significant (0.06, $p < 0.05$). In support of Hypothesis 8, perceived usefulness was a significant predictor of e-learning continuance intention ($\beta = 0.48$, $p < 0.01$). Perceived ease of use was found to predict both perceived usefulness ($\beta = 0.31$, $p < 0.05$) and e-learning continuance intention ($\beta = 0.21$, $p < 0.01$), supporting Hypotheses 9 and 10, respectively. Hypotheses 11–13 were also supported,

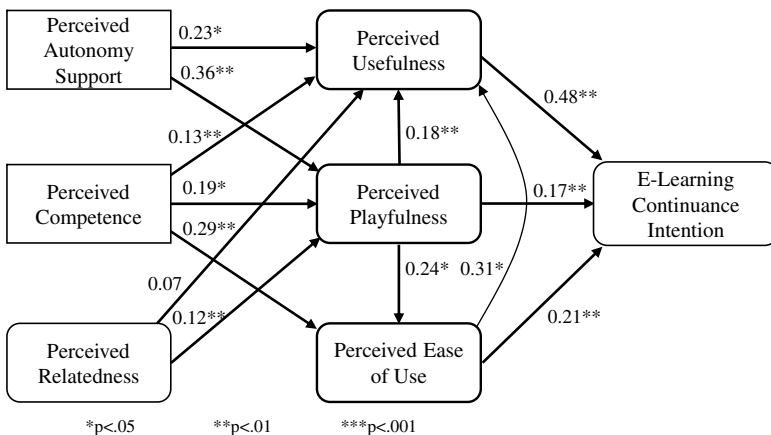


Fig. 2. SEM analysis of the research model.

perceived playfulness was associated with perceived usefulness, perceived ease of use and e-learning continuance intention ($\beta = 0.18, p < 0.01, \beta = 0.24, p < 0.05, \beta = 0.17, p < 0.01$, respectively).

5. Discussion

The goal of the present study was to examine the applicability of self-determination theory to explain the role of intrinsic and extrinsic motivation in the acceptance of e-learning. The present study explored the role of perceived autonomy, perceived competence and perceived relatedness in explaining the influence of intrinsic and extrinsic motivation to continue using IT in a work setting. Intrinsic and extrinsic motivation were operationalized using the TAM constructs of perceived playfulness and perceived usefulness.

Our findings suggest that SDT is useful for conceptualizing the influence of organizational factors in user's motivation. It appears that users are more willing to continue using IT when they feel autonomous and competent, because these basic needs have influence on their intrinsic and extrinsic motivation, perceived usefulness and perceived playfulness, which in turn affect their intention to continue using the IT. In addition, when workers feel connected and supported (perceived relatedness) by co-workers they use the system simply for the enjoyment they obtain from it.

Research on SDT has shown that positive outcomes are more associated with autonomy-supportive motivating style than with a controlling style, such as better learning, performance, and well-being outcomes (Baard et al., 2004; Deci & Ryan, 1985a, 1987; Deci et al., 2001; Grolnick & Ryan, 1987). The current study is one of the first to show that this influence is also significant in the IS domain.

According to the hypothesized motivational model, workers' perceptions of how autonomy-supportive their organization is predict perceived usefulness and perceived playfulness, which in turn predict their intentions to use an IS. In a work setting, an autonomy-supportive context is able to enhance users' extrinsic and intrinsic motivation to use the IT because they perceive the e-learning system to be more useful to achieve their instrumental goals and they enjoy using it more. For example, it might possible to increase perceived usefulness and perceived playfulness if supervisors use motivating techniques or if the company shows to be concerned with workers' situation. Perceived autonomy support also had a significant indirect effect on continuance intention, thus, when the context is autonomy-supportive users tend to persist in their behavior (i.e. system usage). Furthermore, some SDT studies have shown that when the context supports the satisfaction of autonomy people are more likely to maintain their engagement in different types of behaviors (Gagné, 2003; Vansteenkiste, Simons, Lens, Sheldon, & Deci, 2004; Williams & Deci, 1998).

Perceived competence, operationalized through internet self-efficacy and computer self-efficacy, had a strong influence on perceived usefulness, perceived playfulness and also on perceived ease of use. Consistent with SDT, individuals tend to be more motivated to perform a task when they feel competent in it (Deci & Ryan, 1985a). Also in line with previous studies using TAM, when users feel self-efficacious, they tend to perceive the system as more useful and easier to use (Agarwal et al., 2000; Chau, 2001; Venkatesh & Davis, 1996). The strongest effects of internet self-efficacy and computer self-efficacy were on perceived ease of use. Thus, when users have strong self-efficacy beliefs they perceive that less effort is needed to use the system and are more likely to continue using it. This is in line with prior

SDT studies, which have found that perceived competence predicted persistence in behaviors (Williams, Lévesque, Zeldman, Wright, & Deci, 2003; Williams, McGregor, Zeldman, Freedman, & Deci, 2004).

Interestingly, the influence of perceived autonomy support on perceived playfulness was stronger than on perceived usefulness. Also, our model showed that perceived autonomy support was a stronger predictor of perceived playfulness than was perceived competence. This suggests that users perceive the system to be more enjoyable primarily when the context is autonomy-supportive and secondly when they have confidence in their ability to use the computer and Internet. Further, research has shown that increases in perceived competence do not result in increased intrinsic motivation if people do not have a sense of autonomy (Ryan, 1982).

The third basic need, perceived relatedness, was correlated with perceived playfulness but not with perceived usefulness. Users then are more likely to be intrinsically motivated to use the system, when they work in a climate of relatedness. Because SDT proposes that intrinsic motivation is more likely to grow in a climate of relatedness (Ryan & La Guardia, 2000) and individuals are likely to perform behaviors which are not inherently interesting when they are valued by significant others to whom they feel connected (Deci & Ryan, 2000), it is essential for users willingness to continue using the IT that they feel connected to other significant members of the organization.

The indirect effects of perceived autonomy support, perceived competence and perceived relatedness on continuance intention were significant. Therefore, our findings are in line with prior studies in the SDT domain, (Baard et al., 2004; Deci et al., 2001; Ilardi et al., 1993) empirically showed the degree that employees, within any culture, experience the satisfaction of the three basic needs, autonomy, competence and relatedness in their work organizations predicted important aspects of organizational effectiveness, in particular, task engagement.

The results also support prior research in the TAM domain. Perceived ease of use was found to be a significant antecedent of perceived usefulness (Ong & Lai, 2006; Ong, Lai, & Wang, 2004; Taylor & Todd, 1995a). We also confirmed that perceived playfulness plays a critical role in predicting and determining users' perceived usefulness and perceived ease of use. This suggests that when users enjoy using the e-learning system they also perceive that the system will make them more productive, and also the users' perception of the complexity of the e-learning system is inversely related to the degree to which they feel involved and have a sense of enjoyment in using it. Additionally, a number of studies showed that people experience more interest, excitement, and confidence when their motivation is intrinsic, which in turn also improves performance, persistence, and creativity (Deci & Ryan, 1991; Sheldon, Ryan, Rawsthorne, & Ilardi, 1997).

Consistent with prior research, perceived usefulness had a stronger effect on continuance intention than perceived playfulness (Igarria et al., 1994; Teo et al., 1999) and perceived ease of use (Venkatesh & Davis, 2000). Thus, users tend to use the system firstly because they can achieve some positive outcomes, secondly, because they perceive that it is easy to use, and thirdly because they enjoy using the system. In support of this, Koestner and Losier (2002) found that identified motivation was more predictive than intrinsic motivation of engagement in behaviors that are not in themselves interesting and require discipline and explicit effort.

The current analysis has a few important limitations. First, the data collected were cross-sectional, thereby, there is a need for additional longitudinal research to test these

hypotheses. A second limitation of this study is the possibility that results were biased by the self-selection of participants, thus, respondents may have been more motivated than those who did not participate in the survey. Third, personality-based orientations have not been included in our model, according to Causality Orientations Theory (Deci & Ryan, 1985b), a sub-theory of SDT, individuals can interpret the same situation as autonomous or controlled. For example, Baard et al. (2004) found that autonomy-oriented employees tend to experience higher need satisfaction at work, which in turn enhances their performance and well-being. Since, autonomy-oriented individuals behave different than controlled-oriented individuals independently of contextual factors (see Gagné & Deci, 2005 for a review), the influence of personality-based orientation should be examined in future studies in the IT domain.

From the point of view of theory, there are several research directions to be taken, and additional questions regarding the relationships between SDT and TAM remain for future research. We have investigated a limited number of variables to understand continuance intention. Recent studies have extended TAM with new constructs which are important to explain user's continuance intention. For example, subjective norm (Bhattacharjee, 2000; Taylor & Todd, 1995a; Venkatesh & Davis, 2000), perceived credibility (Ong et al., 2004), perceived risk (Hsu & Chiu, 2004a) and computing support and training (Venkatesh & Davis, 2000). Future research is needed to fully understand elements of the work climate that improve or undermine users' continuance intention.

From the managerial point of view, one of the major implications is that organizations should promote autonomy-supportive conditions, perceptions of competence and relatedness among their workers to increase the acceptance of the IT, because users will show greater interest, greater effort and better performance learning and using the system, that is, companies should train supervisors to use autonomy-supportive techniques with subordinates. In line with SDT, when individuals participate in an event or task because it is interesting and enjoyable, they show more engagement in the activity. Therefore, programmers and developers should build e-learning systems with modern interfaces and friendly screens to improve intrinsic motivation and influence users' continuance intention, because enjoyment and cognitive absorption are likely to be experienced with technologies that are visually appealing (Agarwal & Karahanna, 2000). Further, it is possible to increase perceived playfulness by also enhancing perceived relatedness through regular meetings, supporting cooperation, sharing information with colleagues and team-building exercises (Baard, 2002). Since not all users consider system usage as enjoyable or interesting, a more useful solution is to increase identified motivation (i.e. usefulness) through an autonomy-supportive work climate (Deci et al., 1994). The present results also raise some training recommendations. Since, self-efficacy is an important outcome of the training process, this study suggests that instruction should be given in a climate of autonomy support. Furthermore, trainees should establish a set of achievable goals with an optimal challenge and they should be given regular constructive feedback during instruction to increase perceived competence (Baard, 2002).

In summary, this research takes an initial step toward extending and validating TAM with motivational factors affecting perceived usefulness and perceived playfulness in a work context. It provides support for the critical role of user's perceptions of autonomy, competence and relatedness in their work setting as significant determinants of TAM variables.

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