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What leads people to keep on e-learning? An empirical analysis of users' experiences and their effects on continuance intention

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User retention is a major goal for higher education institutions running their teaching and learning programmes online. This is the first investigation into how the senses of presence and flow, together with perceptions about two central elements of the virtual education environment (didactic resource quality and instructor attitude), facilitate the user's intention to continue e-learning. We use data collected from a large sample survey of current users in a pure e-learning environment along with objective data about their performance. The results provide support to the theoretical model. The paper further offers practical suggestions for institutions and instructors who aim to provide effective e-learning experiences.

Keywords: e-learning; higher education; flow; presence; didactic resource; instructor attitude

Introduction

e-Learning is a key activity in a knowledge, network society (Castells, 2005, p. 16). By means of the digital technologies placed in the core of the network society, higher education institutions create and disseminate knowledge, and contribute decisively to citizens' life-long learning. Not surprisingly, e-learning has experienced meteoric growth since its emergence in the mid-1990s. As a matter of fact, there are an increasing number of people embracing e-learning. This has spurred on a robust and unstoppable surge in income for e-learning initiatives, which is expected to reach US$168.8 billion by 2018 (Global Industries Analysts, 2012). Thanks to these flourishing educational activities, individuals build meaningful knowledge in the domain they have chosen, in a productive, appealing, and engaging fashion.

For their part, universities and corporate educational organisations have benefited from the broadening accessibility, cost-effectiveness, and increasing potential demand for e-learning programmes. But besides these advantages, higher education institutions progressively face much more vigorous competition, as well as diverse requests that come from a bigger pool of individuals, who in many cases are already aware of what e-learning

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could do for them. Hence higher education institutions need to gain a complete understanding of the connections between their potential e-learning strategies and the individuals' experiences that lead to user retention. This goes beyond identifying factors driving e-learning adoption. Rather, it requires the development of a solid integrated framework for showing the formation of appealing e-learning experiences, which accompany continued successful behavioural results and user maintenance.

So far, a great deal of research effort has been directed at elements of quality in e-learning that are under the control of the education institution, like digital didactic resources and activities led by instructors online. The analyses of these quality-related factors provide a very good jumping off point for studying users' experiences in e-learning. However, individuals' experiences are not a simple sum of the elements that configure the education environment nor are they perceptions that are only about the quality of such an environment. Rather, these e-learning experiences can comprise a greater variety of subjective outcomes that are the result of users' exposure to the educational value proposition.

Research under the principles of the technology acceptance model (TAM) has shed considerable light on the understanding of learners' perceptions of ease of use and the usefulness of a virtual education environment, and these perceptions are linked with individuals' behavioural intentions regarding e-learning. Nevertheless, as shown by contributions from the fields of human–computer interaction and consumer behaviour, users' online experiences not only involve their individual beliefs in regard to the utility of the online value proposition, but also manifest in the form of the psychological phenomena of presence and flow. In the particular context of virtual education environments, users might feel that they are "present" in a real, material space, where they meet their instructors and classmates, and have the opportunity of taking part in real debates. And the exploration of didactic resources, together with the cooperative work online, can appear so interesting and captivating that they can generate intense joy and immense satisfaction, characteristic of the states of mind of flow. The effect is that both presence and flow can have a relevant role in boosting individuals' behaviour with regard to the continued use of the e-learning environment.

Precisely, the research purpose of this study is to examine the role of two central elements (didactic resource quality and instructor attitude) of the virtual education environment, presence feelings, and flow states in e-learning users' experiences, and their contribution to the formation of users' decisions to continue using an e-learning environment. On the basis of integrating aspects of e-learning literature, principles of TAM, presence research and Flow Theory, we develop a comprehensive conceptual model of the continuing acceptance of e-learning that includes direct and indirect drivers. And we empirically test the model and find support for the causal relationships that compose it. In an attempt to neutralise specific perceptions, attitudes, and behavioural intentions that might result in sporadic visits to a virtual learning environment, once it has been adopted, the context for our study is the consistent use of e-learning in post-adoption situations.

By pursuing these goals, we build an explanatory model on e-learning continuance intention, which is new in the literature and contributes to expand the current knowledge on users' experiences in e-learning. The paper is organised as follows: in the next two sections we develop the conceptual model and provide relevant literature to support the relationships incorporated. After this we present the methodology and the results yielded by the data analyses. We conclude with a discussion of the findings, managerial implications, limitations, and suggestions for further research.

Background on e-learning acceptance and user experiences

e-Learning helps people meet their educational needs via a wide spectrum of digital technologies, including comprehensive platforms that provide the usual functionalities of a conventional university (or corporate) campus. It allows individuals to construct their own knowledge by offering full access to didactic resources and teaching–learning methods, beyond the constraints of time and location; and empowers individuals to tailor content and teaching communications to their particular requirements.

Didactic resources and teaching processes have been identified by previous research as central pillars of e-learning initiatives. In order for the teaching–learning processes to develop properly, users should interact dynamically with the digital didactic resources (Sun, Tsai, Finger, Chen, & Yeh, 2008; Udo, Bagchi, & Kirs, 2011); and instructors, rather than act as mere disseminators of information, should become facilitators of learning, who design materials, and individually guide and advise users along their learning processes (Clark, 2002; Edwards, Perry, & Janzen, 2011). Yet scholars and education institutions alike still have much to learn about the connections between these two anchors of e-learning and the users' willingness to continue using virtual education. For instance, the literature provides some evidence about resource designs and teaching strategies that might go against e-learning continued acceptance. This is because they lead users to either feel lost among all the content and advice presented (Burbules & Callister, 1996; Rodríguez-Ardura, Jiménez-Zarco, Ammetller-Montes, & Pacheco-Bernal, 2009) or to end up completing relevant study activities outside the virtual education environment (Ryan, Valverde, & Rodríguez-Ardura, 2001). What is more, red flags have been raised about instructors' difficulties to meet the diversity of incoming users' requirements (Martínez, Miláns del Bosch, Pérez Herrero, & Sampedro Nuño, 2007); and those users who feel isolated tend to abandon the e-learning programmes prematurely (Joo, Lim, & Kim, 2011).

To study continued use of e-learning, TAM is a valid and robust theoretical framework (King & He, 2006). Originally introduced by Davis (1985, 1989) to explain acceptance of new digital technologies in the context of white-collar performance, TAM is grounded in the theory of reasoned action (TRA) (Ajzen & Fishbein, 1980; Fishbein & Ajzen, 1975), which is a well-established theory on attitude–behaviour linkages. According to TRA, individuals behave in accordance with their attitudes towards performing concrete behaviours; in turn, their attitudes depend on their personal beliefs about the potential effects of carrying out such behaviours. Specifically, TAM posits that the acceptance of a particular digital technology is driven by the user's perceptions about the ease of use and the usefulness of that technology. Davis (1989, p. 320) conceived perceived ease of use as "the degree to which a person believes that using a particular system would be free of effort," and perceived usefulness as "the degree to which a person believes that using a particular system would enhance his or her job performance." Following the TRA reasoning, users' beliefs about a digital technology trigger their individual attitudes towards using this technology, which will then determine their behavioural intentions about using such technology. The causal links between the core variables intervening in the TAM have had consistent and strong support across a wide spectrum of contexts of use of digital technologies (King & He, 2006; Yousafzai, Foxall, & Pallister, 2007), including those as regards e-learning.

Nevertheless, the concepts of perceived ease of use and perceived usefulness do not seem to totally capture the range of subjective feelings derived from e-learning. This is because the virtual education environment can unleash a holistic bunch of subjective responses whose components influence user's behavioural intentions. And these components do not always manifest in perceptions about the utility of the value proposition

offered through the digital technology. On the basis of literature in consumption experiences, Rose, Clark, Samouel, and Hair (2012) assert that online users interpret incoming information from affective and cognitive perspectives. While affective mechanisms intervene in the formation of perceptions related to the utilitarian facets of the online value proposition, such as ease of use and perceived benefits, cognitive processing would facilitate the emergence of psychological phenomena, in the form of flow states and feelings of presence, which occur when users entirely immerse themselves in the virtual environment created by the technology (Rose et al. 2012). When feeling immersed in this alternative environment, users orient their cognitive efforts towards the incoming digital information (Schubert, 2009), to the extent that they temporarily remain at arm's length from their physical, immediate surroundings, and suspend disbelief in the realness of the virtual milieu (Lombard & Ditton, 1997; Wirth et al., 2007).

The importance of experiential aspects soon found support from investigations on digital technologies acceptance (Davis, Bagozzi, & Warshaw, 1992; Venkatesh, 1999, 2000; Venkatesh, Speier, & Morris, 2002). In connection with self-determination theory (Deci & Ryan, 1987), these studies conceived ease of use and usefulness as sources of extrinsic motivation to adopt digital technology. And they claimed to incorporate internal motivational factors as relevant drivers too. Specifically, extrinsic (i.e. utilitarian) motivations direct individuals' behaviour to obtain the instrumental benefits derived from performing a chosen task. In contrast, internal drivers are activated when the activity produces its own intrinsic motivation or incentives, so individuals devote themselves to the activity for the reward, satisfaction or pleasure stemming from the activity itself. Based on this logic, some, although very few, studies on e-learning continuance have suggested that users might show themselves to be self-determining and intrinsically motivated to e-learn, provided that they have real interest in the learning activities. If so, they experience enjoyable states of mind while building knowledge (Chiu, Sun, Sun, & Ju, 2007; Chiu & Wang, 2008; Lee, 2010; Tao, Cheng, & Sun, 2009).

Consistent with this, an important theory considered here is Flow Theory. This theory gravitates around the construct of flow, introduced by Csikszentmihalyi (1975) when studying people's intrinsic motivations and feelings of enjoyment. Flow is conceived as a cognitive state, very enjoyable, and positive for the individual, which contributes to improve their psychological well-being (Chen, Wigand, & Nilan, 2000). It surfaces when the cognitive challenge that involves carrying out the task at hand, or building knowledge, is balanced with the individual's skills. In employing their capabilities to overcome the challenges presented by the activity, individuals stay focused and push aside thoughts that are irrelevant to the purpose. Online users experiencing flow, concentrate their mental energies on the activities they develop through the digital technology, to such a point that they lose notion of time and drop self-consciousness (Hoffman & Novak, 1996; Novak, Hoffman, & Yung, 2000). Research has found that flow states lead to favourable attitudes towards the value proposition (Huang, 2012; van Noort, Voorveld, & van Reijmersdal, 2012), and to learning performance (Choi, Kim, & Kim, 2007; Ho & Kuo, 2010). This is because users in flow show a higher willingness to explore and retain the information presented to them. Eventually, flow states can make the prolongation of digital technology's usage easier, and increase the intention to continue using the virtual environment (Koufaris, 2002).

In addition to flow, a relevant component of individual experiences online is the user's illusion of being physically located in the virtual terrain as drawn by the technology (Biocca, Harms, & Burgoon, 2003; Lombard & Ditton, 1997; Saunders, Rutkowski, von Genuchten, Vogel, & Orrego, 2011). This phenomenon has its roots in people's need to operate on the basis of space dimensions. In their attempt to comprehend the virtual environment, individuals build cognitive-mental spaces within which they place

themselves. Indistinctly known as telepresence (Steuer, 1992), spatial presence (Wirth et al., 2007) or simply presence (Sas & O'Hare, 2003), the subjective feeling of "being present" in a virtual milieu is acknowledged as a behavioural construct with great explicative power of online users' decisions. Unsurprisingly it has received substantial interest, mainly from arenas of human–computer interaction. Without a sensation of presence, the use of a digital technology may just provoke simple visualisations of the technological creation, sensorimotor feedback, or mere readings of informative resources. By contrast, users who experience presence recreate alternative realms, stir memories, and imagine, plan, or perform activities in which other users might also intervene. Intense feelings of presence lead individuals to focus on the virtual environment to the point that they dissociate from immediate reality and plunge into an alternative realm, where they feel located. The crucial role of presence has been noted by e-learning research, which has identified it as key in immersing users in teaching–learning processes (Garrison & Arbaugh, 2007).

Closely related as they might be (Faiola, Newlon, Pfaff, & Smyslova, 2012), flow and presence are understood here to be distinct, influential constructs. In line with investigations that explored the connections between flow and presence (Mollen & Wilson, 2010; Weibel & Wissmath, 2011), we conceive them as two different sides of user's cognitive immersion in a virtual education environment. While flow will refer to the state occurring when being narrowly focused on the learning activity developed in the virtual domain, presence will cover the spatial aspects when feeling placed in this alternative milieu. Thus, users highly immersed in a virtual environment may perceive an immersion in the learning task (flow), as well as spatial immersion (presence).

The conceptual model and hypotheses

Figure 1 shows our conceptual model of the intention to continue e-learning. The model includes four types of causal paths which are presented and discussed: original TAM paths, extended TAM paths rooted in e-learning literature, paths that stem from Flow Theory, and paths from presence research. In total, nine variables intervene that either impact directly or indirectly on users' behavioural intention to continue e-learning. Table 1 further summarises the hypotheses incorporated and the previous supporting literature, and indicates whether the empirical test will offer new evidence within the context of e-learning continuance, or will confirm and bring support to existing knowledge.

TAM antecedents

Original TAM's beliefs–attitude–intention relationships have been translated into the context of e-learning to explain e-learning acceptance on several occasions (for a review see Šumak, Heričko, & Pušnik, 2011). But most of these studies focus on e-learning first adoption, whereas only a few address post-adoption decisions, throughout which users reconsider the virtual learning environment and determine whether to continue using e-learning or not (Table 1). Within this last context, attitude constitutes the affective response that mediates user's beliefs and his or her intention to continue e-learning (Lee, 2010; Lin, 2011). For their part, perceived ease of use and perceived usefulness are two factors that are distinct yet connected and capture user's beliefs about e-learning performance. Perceived ease of use encapsulates the degree to which the user feels that using the e-learning environment is convenient and free of cognitive effort (Saadé & Bahli, 2005); whereas perceived usefulness can be described as the degree to which the user views that the e-learning environment "boosts their learning capabilities" (Arteaga Sánchez &

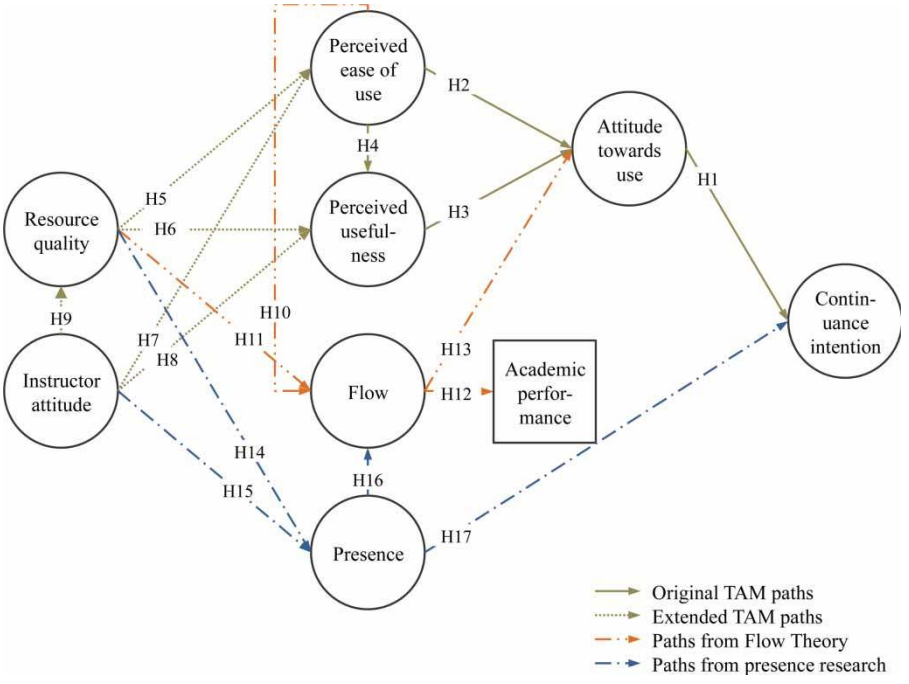

Figure 1. Conceptual model of e-learning continuance intention.

Duarte Hueros, 2010, p. 1635) and thus fulfils their learning goals (Lin, Chen, & Fang, 2011). Both factors can precede user's attitude towards the continued use of e-learning (Lee, 2010; Lin et al., 2011). Furthermore, virtual environments that are easy to use for gaining knowledge can elicit the perception that they are functional and effective (Shih, 2004), which can facilitate perceived usefulness (Cho, Cheng, & Lai, 2009; Lee, 2010; Lin, 2011; Lin et al., 2011; Roca & Gagné, 2008). See the corresponding hypothesis statements, *H1–H4*, in Table 1.

Perceptions about the e-learning environment

TAM further suggests that user's beliefs, regarding the ease of use and the usefulness of the digital technology, are subject to the influence of external factors. But in the learning acceptance literature, there is no consistent criterion about the choice of such factors, insofar as they range substantially among studies. In addition, we find clear predominance of technology-related variables against others that have to do with the development of online learning activities, which could be more decisive in the concrete target context (Bhuasiri, Xaymoungkhoun, Zo, Rho, & Ciganek, 2012; Selim, 2007). In fact, most prior factors evaluated stem from variables already considered in the broader domain of digital technology acceptance, which relate to: computer self-efficacy; technical information, guidance, and support; and technical capabilities of the virtual environment – including system characteristics, system quality, presentation formats, and interface design. In contrast, and though influential, drivers tied to the teaching–learning processes remain relatively underexplored in extended TAM models. Here, we can situate prior variables concerned with the quality and adequacy of the didactic resources, and to the teaching characteristics. In fact, both variables have often been identified, in the broader domain of education literature, as major

Table 1. Summary of the model of e-learning continuance intention and its links with supporting literature.

Hypotheses		Contexts of previous testing in e-learning	Supporting literature
H1	Attitude towards using the e-learning environment has a positive effect on e-learning continuance intention	Previously tested in the context of e-learning continuance	Lee (2010), Lin (2011), and Lin et al. (2011)
H2	Perceived ease of use has a positive effect on attitude towards using the e-learning environment	Previously tested in the context of e-learning continuance	Lee (2010) and Lin et al. (2011)
H3	Perceived usefulness has a positive effect on attitude towards using the e-learning environment	Previously tested in the context of e-learning continuance	Lee (2010), Lin (2011), and Lin et al. (2011)
H4	Perceived ease of use has a positive effect on perceived usefulness of the e-learning environment	Previously tested in the context of e-learning continuance	Cho et al. (2009), Lee (2010), Lin (2011), and Roca and Gagné (2008)
H5	Perceived didactic resources quality has a positive effect on perceived ease of use of the e-learning environment	Previously tested for e-learning adoption – New test in the context of e-learning continuance	Cheng (2012), Lee et al. (2009), and Liu et al. (2010)
H6	Perceived didactic resources quality has a positive effect on perceived usefulness the e-learning environment	Previously tested for e-learning adoption – New test in the context of e-learning continuance	Chen (2010), Cheng (2011, 2012), Lee (2006), Lee et al. (2009), and Liu et al. (2010)
H7	Instructor attitude has a positive effect on perceived ease of use of the e-learning environment	New test	Lin (2011)
H8	Instructor attitude has a positive effect on perceived usefulness of the e-learning environment	Previously tested for e-learning adoption – New test in the context of e-learning continuance	Cheng (2012) and Lee et al. (2009)
H9	Instructor attitude has a positive effect on the perceived quality of the e-learning resources	Previously tested for perceived quality of e-learning – New test in the context of e-learning continuance	Peltier et al. (2007)
H10	Perceived ease of use has a positive effect on flow in the e-learning environment	Previously tested in the context of e-learning continuance	Tao et al. (2009)
H11	Perceived didactic resources quality has a positive effect on flow in the e-learning environment	Previously tested for e-learning adoption – New test in the context of e-learning continuance	Cheng (2012) and Choi et al. (2007)

(*Continued*)

Table 1. Continued.

Hypotheses		Contexts of previous testing in e-learning	Supporting literature
H12	Flow in the e-learning environment has a positive effect on academic performance	Previously tested for self-reported performance – New test for e-learning objective performance	Choi et al. (2007) and Ho and Kuo (2010)
H13	Flow in the e-learning environment has a positive effect on attitude towards using the e-learning environment	Previously tested in the context of e-learning continuance	Lee (2010) and Roca et al. (2006)
H14	Perceived didactic resources quality has a positive effect on presence in the e-learning environment	New test	Nagel and Kotzé (2010)
H15	Instructor attitude has a positive effect on presence in the e-learning environment	Previously tested for e-learning satisfaction – New test in the context of e-learning continuance	Kim et al. (2011)
H16	Presence has a positive effect on flow in the e-learning environment	Previously tested for e-learning attitude – New test in the context of e-learning	Huang et al. (2010) and Leong (2011)
H17	Presence in the e-learning environment has a positive effect on e-learning continuance intention	Previously tested for e-learning adoption – New test in the context of e-learning continuance	Davis and Wong (2007)

facilitators of user's learning achievements (Chien, 2012; Paechter, Maier, & Macher, 2010) and users' satisfaction in e-learning (Ozkan & Koseler, 2009; Peltier, Schibrowsky, & Drago, 2007; Wang, 2003); this leads us to anticipate their potential influence on e-learning continued intention (Roca, Chiu, & Martínez, 2006).

Didactic resources include content and tools, of all kind of origins and formats (e-books, theme repositories, podcasts, databases, study guides, etc.), that are employed to perform the learning processes. In e-learning, quality and updated didactic resources become one of the main sources of information and knowledge, hence they can activate favourable perceptions about the ease of use and the usefulness of the education environment. A scattering of studies on first adoption of e-learning found evidence that confirms this, and showed a significant impact of didactic resource quality on perceived ease of use (Cheng, 2012; Lee, Yoon, & Lee, 2009; Liu, Chen, Sun, Wible, & Kuo, 2010) and usefulness (Chen, 2010; Cheng, 2011, 2012; Lee, 2006; Lee et al., 2009; Liu et al., 2010). These potential effects are further consistent with findings, for the context of e-retailing adoption, about the causal link between the content's perceived quality and user's beliefs about ease of use and usefulness. For instance, (Ahn, Ryu, & Han, 2007) noted that the quality of the digital information presented to the users influence their beliefs of having the necessary information to use the virtual environment, and thus determine the perceptions of both ease of use and usefulness of that specific environment.

Instructor attitude, for its part, refers to the "instructor's personal approach, teaching style and their advice/help" within the virtual education environment (Choi et al., 2007, p. 230). The particular way in which instructors design learning resources and conduct

teaching activities can be even more important in virtual education environments (Govindasamy, 2002; Webster & Hackley, 1997), where users are at risk of feeling isolated. Instructors can motivate users and effectually help them gain knowledge by means of continuous communication and interaction, by using appropriate didactic material, by leading relevant learning activities, and through their timely and effective guidance and support. So it seems reasonable to presume that positive instructor attitudes lead users to regard the e-learning environment as easy to use (Lin, 2011) and useful (Cheng, 2012; Lee et al., 2009). In the context of e-retailing, similar effects were detected by Ahn et al. (2007) for communication mechanisms offered to gather questions and complaints, and solve them appropriately. Additionally, instructors with more empathy and interest in learners can be more willing to design and make use of relevant and updated didactic resources, which foster meaningful learning experiences (Peltier et al., 2007). Taking all of this into consideration, we hypothesise that high levels of both didactic resources' quality and an instructor's encouraging attitude have a direct and positive impact on perceived ease of use and usefulness (*H5–H8* of Table 1). And the more favourable the instructor's attitude is, the greater the perceived quality of didactic resources will be (*H9*).

Flow states

Flow, during e-learning, is characterised by the user's entire immersion in a challenging activity that takes place in the virtual education environment. Originally, Csikszentmihalyi (1990) conceptualised flow as a melding that results from: an adequate balance between the user's skills and the perceived challenges presented by the activity that he or she is undertaking; a merging of one's conscious awareness and the activity; well-defined activity's goals; quick and understandable feedback; complete concentration on the activity; a loss of self-consciousness; a feeling of control over the activity; a lack of awareness of the passing of time; and a perception of the activity as rewarding for its own sake. On the basis of this conceptual definition, important empirical research was done to understand flow elicited in virtual environments (Hoffman & Novak, 2009), and some studies, albeit not many, dealt with flow in the particular context of e-learning. Within this group, a handful of papers explored the connections between flow and users' beliefs about the utility of the virtual education environment, in an attempt to explain early use of e-learning. But the results yielded are not consistent and somewhat conflicting: while some of these studies incorporated flow as a determinant of perceived ease of use and usefulness (Martínez-Torres et al., 2008; Padilla-Meléndez, del Águila-Obra, & Garrido-Moreno, 2013; Saadé & Bahli, 2005; Toral, Barrero, & Martínez-Torres, 2007; Yi & Hwang, 2003); others detected a positive effect of ease of use on flow (Cheng, 2011, 2012; Lee, Cheung, & Chen, 2005). Nevertheless, the only study that assessed these linkages for the specific context of e-learning continuance (Tao et al., 2009) observed that ease of use precedes flow (operationally defined as perceived playfulness) and not the opposite, which coincides with the direction of the relationship between ease of use and enjoyment incorporated in Davis et al.'s (1992) motivational model. The rationale of this direction comes from self-efficacy theory – which argues the influence of self-efficacy on intrinsic motivation (Bandura, 1982); and the consideration of ease of use as a source of beliefs of self-efficacy. Following this line of reasoning, e-learning users who feel a greater level of self-efficacy and competence (i.e. who believe that the education environment is easy to use) are more likely to find the environment compelling and enjoyable; thus, they enter into cognitive states of flow (*H10*).

Again, users' perceptions about the quality of didactic resources can have an important role in e-learning experiences; this time facilitating users' flow states (Cheng, 2012; Choi

et al., 2007; Rha, Williams, & Heo, 2005). Learning activities are so closely connected with the didactic resources offered to the users that, regardless of the environment's technological and design characteristics, if the users cannot access the information they need, they will be less likely to be engrossed and find joy in learning tasks. This is in harmony with Chung and Tan's (2004) findings, who identified quality content as the most influential environmental characteristic on flow (operationalised as playfulness); and Hwang and Kim's (2007), who showed the contribution of online quality content to enjoyment. On top of that, Jung, Pérez-Mira, and Wiley-Patton (2009) and Zhou, Li, and Liu (2010) proved that online content recognised as up-to-date, adequate and sufficient, predicts flow in smartphone usage. And e-learning research has further illustrated the positive effects of didactic resources on user satisfaction (Peltier et al., 2007; Wang, 2003) and perceived success of the virtual environment (Selim, 2007). Therefore, we suggest that e-learning environments fitted with quality didactic resources are more likely to elicit flow states (*H11*).

It has been suggested that flow generates positive outcomes, such as higher academic performance and favourable attitudes towards the education environment. In fact, early research on flow already claimed that flow facilitates learning (Csikszentmihalyi, Rathunde, & Whalen, 1997; Ghani, 1995; Skadberg & Kimmel, 2004). It is reasoned that flow is a highly dynamic, working state. By itself, it encourages the learner's attention, concentration, and energy, which results in greater learning performance. And in order to continue to experience flow, users are more inclined to take challenges that are of increasing intellectual difficulty.

Yet within the context of e-learning, evidence about the impact of flow on learning performance is scarce and contradictory. To the best of our knowledge, only two studies (Konradt & Sulz, 2001; Rossin, Ro, Klein, & Guo, 2009) have attempted, unsuccessfully, to prove the linkage of flow with e-learning performance measured objectively (by means of academic assessments). But a positive influence of flow on self-reported learning performance has been detected (Choi et al., 2007; Ho & Kuo, 2010). To reject the possibility that this effect could be attributed to common method variance (Bakker, Oerlemans, Demerouti, Slot, & Ali, 2011) and provide complementary support for the potential influence of flow in e-learning, we will not operationally define learning performance as users' own perceptions about the abilities acquired with e-learning. Instead we will take an objective operationalisation of academic performance (*H12*). In addition, we suggest that the user's affective attitude towards the learning virtual environment is influenced by flow (Lee, 2010; Roca et al., 2006). In other words, we expect that e-learning users are more likely to take pleasure in their learning experiences under optimal enjoyment states; ultimately their attitude towards e-learning improves (*H13*).

Presence feelings

In the particular context of e-learning, presence is thought to accompany the constructive production of understanding. It manifests: in the awareness of instructors and other users belonging to the learning community; in the relationships built within this particular virtual environment; and in the appreciation, generation, and exchange of knowledge by collaborative ways – see Garrison, Anderson, and Archer (1999) for a review. Despite the scarcity of questionnaire-based empirical studies on presence's antecedents in e-learning, it seems reasonable to anticipate that the contextual aspects pertaining to the virtual environment considered here (i.e. perceived quality of didactic resources and instructor attitude) can prompt sense of presence. Similarly to effects of meaningful content detected within virtual reality environments (Fryer & Freeman, 2012; Hoffman, Prothero, Wells,

& Groen, 1998), a course's didactic resources can provide the foundations for presence feeling by helping users become drawn into the e-learning environment (Nagel & Kotzé, 2010). And direct instructions and facilitation offered by educators can further contribute to presence when aligned with teaching strategies that help to perceive the instructor's proximity (Kim, Kwon, & Cho, 2011; Nagel & Kotzé, 2010). As reported by Edwards et al. (2011), these strategies are realised by creating a sense of intimacy between instructor and user, fostering user participation, and showing genuine concern for user's learning. Therefore, we propose that the instructor's positive attitude towards the user, likewise perceived quality of didactic resources, prompt presence feelings (*H14–H15*).

The potential influence of presence on user behavioural intentions, either directly or indirectly, has already been observed. Following in the footsteps of Hoffman and Novak (1996) and Novak et al. (2000), investigations on flow for education environments (Huang, Backman, & Backman, 2010; Leong, 2011) have given support for the role of presence in flow's formation. Presence is believed to take users to an online realm where they feel more connected and accessible to the learning initiatives available, so that they are more likely to feel absorbed in such activities (*H16*). For its part, research in online consumption experiences has offered a body of evidence that points out the correspondence of presence and behavioural intentions about the value proposition (Fiore, Kim, & Lee, 2005; Nah, Eschenbrenner, & DeWester, 2011), including continuance intention (Jung, 2011). In tune with this, Shin (2003) and Joo et al. (2011) hold that e-learning users who feel placed in a humanised learning environment, see its value in reaching their desired goals; and Davis and Wong (2007) have found that users feeling presence are more willing to adopt e-learning. Consistent with this, we suggest that presence contributes to the individual's proneness to continue using e-learning (*H17*).

Research methodology

Data collection

The data employed to test the conceptual model were obtained from an open distance university in the European higher education area. The university runs a pure-online education model that requires students to access their virtual classrooms to complete their courses and use, regularly and consistently, resources and services within the virtual education environment. Data collection was performed by means of: an anonymous web-based survey conducted in Spring semester 2010; and registrar's office data of students' academic records from the semester of reference. The questionnaires were distributed by the university's registrar office and included the unique identifier of the student at the university. This code was used later on to merge the data obtained through the survey with registered data about students' academic performance.

The sample frame consisted of current users of the degree programmes, undergraduate and post-graduate, who had already taken and passed a semester at the university. After cleansing, a total of 2530 usable questionnaires were gathered, which fulfils, by far, sample size requirements for structural equation modelling (SEM) (i.e. 20 times the number of free parameters to be estimated). The respondents averaged between 26 and 35 years, and 51% were women. Students came from 35 degree programmes (undergraduate and post-graduate) across a wide spectrum of disciplines – which include Business, Economics, Political Science, Law, Education, Psychology, Humanities, Linguistics, Computer Science, and Communication Science.

Measurement

Measurement items for the constructs in the survey were selected and adapted from previous relevant research (see Appendix). Items were modified to reflect the particular virtual education environment used by the university (termed "Campus"), and made available in the two languages commonly used by students. Except for F2, all items were answered on a 7-point Likert-type scale, anchored between "strongly disagree" and "strongly agree." F2 was assessed using a 7-point scale, anchored at "never" and "several times a day." Continuance intention was measured through items adapted from Roca et al. (2006), who in turn developed them from Davis's (1989) and Bhattacherjee's (2001). The scale items for attitude towards use came from Taylor and Todd's (1995) study. Perceived ease of use items were selected and adapted from Davis's (1989), while perceived usefulness's ones were derived from Davis's (1989) and Davis, Bagozzi, and Warshaw's (1989). To measure didactic resources quality, three items of Wang (2003) were chosen and customised. And adapted from Choi et al. (2007) were the items for measuring instructor attitude, which they had, in turn, developed from Volery and Lord (2000). Consistent with our interest on flow as an overall, holistic state, we employed the direct measure proposed by Novak et al. (2000) instead of a measure that would utilise flow's components. So far, however, there is no consensus in the literature when it comes to which, of these two approaches, is the most appropriate to operationalise flow (Hoffman & Novak, 2009). Also from Novak et al. (2000) are the three scale items selected and adapted to measure presence – which Novak et al. (2000) developed further from Kim and Biocca (1997).

Academic performance was captured by adding the final marks achieved in all courses taken by the e-learner in the period of reference. Course marks ranged from zero (unsatisfactory) to five (excellent work).

Results

Tests of the model were performed through SEM, and by using SPSS 21.0 and AMOS 21.0 software. Model estimation was done with the maximum likelihood approach. Data analysis proceeded in two steps. In the first step, the reliability and the validity of the self-reported measures were tested in order to develop the measurement model of the corresponding constructs. In the second step, a SEM analysis allowed us to explore all the causal relationships hypothesised.

Measurement model

The internal reliability of the self-reported constructs was assessed by computing the Cronbach's α and item-to-total correlations. As seen in Table 2, the Cronbach's α values for all these constructs surpass the requested 0.7 level; and values for item-to-total correlation are clearly above 0.60 – which is the recommended level for field studies. Hence, from the internal point of view, the constructs were deemed adequate.

We measured the convergent validity by factor loading, composite reliability (CR), and the average variance extracted (AVE) measure. It can be seen in Table 2 that all factor loadings improved the recommended value of 0.60. The CR is greater than the recommended value of 0.70 for every self-reported construct, while the AVE is greater than the lower bound of 0.50 in all cases except for *presence*. But since this latter value is pretty close to the minimum, we do accept that convergent validity is also accomplished. Moreover, CR is always greater than AVE, which is a desired condition concerning the convergent validity.

Table 2. Reliability, convergent validity, and discriminant validity tests.

Construct	Variable	Cronbach's α	Item-total correlation	Factor loading	CR	AVE	MSV	ASV
Continuance intention	INT1	0.851	0.748	0.935	0.859	0.753	0.621	0.321
	INT2		0.748	0.935				
Attitude towards use	AU1	0.905	0.802	0.914	0.910	0.772	0.692	0.339
	AU2		0.791	0.906				
	AU3		0.855	0.939				
Perceived ease of use	PEOU1	0.881	0.721	0.831	0.884	0.605	0.310	0.197
	PEOU2		0.685	0.799				
	PEOU3		0.747	0.848				
	PEOU4		0.785	0.875				
	PEOU5		0.644	0.768				
Perceived usefulness	PU1	0.906	0.805	0.845	0.911	0.721	0.692	0.333
	PU2		0.722	0.908				
	PU3		0.816	0.926				
	PU4		0.809	0.862				
Perceived didactic resources quality	PDRQ1	0.853	0.691	0.862	0.859	0.671	0.407	0.256
	PDRQ2		0.791	0.915				
	PDRQ3		0.694	0.863				
Instructor attitude	IA1	0.854	0.749	0.895	0.866	0.683	0.238	0.130
	IA2		0.694	0.858				
	IA3		0.768	0.906				
Flow	F1	0.870	0.729	0.879	0.879	0.708	0.471	0.175
	F2		0.816	0.924				
	F3		0.726	0.879				
Presence	P1	0.748	0.629	0.837	0.748	0.498	0.471	0.124
	P2		0.645	0.829				
	P3		0.716	0.781				

Discriminant validity was tested by comparing, for each self-reported construct, its AVE value with its maximum shared squared variance (MSV) and its average shared squared variance (ASV). In all comparisons, AVE values are greater than MSV and ASV values (Table 2), which shows that the measures of the constructs examined are robust in terms of their discriminant validity.

Structural model

The summary of the fit indices taken in consideration is shown in Table 3. As χ^2 statistic is sensitive to sample size, the test nearly always rejects the model when large samples, like ours, are used (Bentler & Bonett, 1980). Not surprisingly, the χ^2 test indicates here that we should reject the null hypothesis that the reduced model fits the data as well as does the full (saturated) model (p-value = 0.000). We therefore have to move our attention from χ^2 and χ^2/d.f. to three other absolute fit measures. First, the goodness of fit index (GFI) surpassed the recommended value of 0.80 for acceptable fit, showing that we have a good fit. We obtain that 93.5% of the variance in the sample variance–covariance matrix is accounted for by the model. Second, the standardised root mean square residual (SRMR) is lower than the acceptable upper bound of 0.08. In addition, the root mean square error of approximation (RMSEA) further shows a good fit value, since it remains below the recommended value of 0.08 (MacCallum, Browne, & Sugawara, 1996).

In order to compare the proposed model with the null model, we consider four different incremental fit measures. First, the adjusted GFI (AGFI) shows that we get a good

Table 3. Fit indexes for the structural model.

Fit index	Value	Recommended cut-off values
Absolute fit measures		
χ^2	2264.887	The lower the better
d.f.	308.000	
p-Value	0.000	>0.05
χ^2/d.f.	7.354	<5
GFI	0.935	>0.80
SRMR	0.059	<0.08
RMSEA	0.050	<0.08
Incremental fit measures		
AGFI	0.920	>0.80
NFI	0.948	>0.90
TLI	0.949	>0.90
CFI	0.955	>0.95
Parsimonious fit measures		
PGFI	0.761	>0.50
PNFI	0.832	>0.50
PCFI	0.838	>0.50

incremental fit result since it is clearly greater than 0.80. Second, the normed fit index (NFI) surpasses the minimum required value of 0.90. Additionally, the Tucker–Lewis index (TLI) and the comparative fit index (CFI) are greater that the suggested lower bounds of 0.90 and 0.95, respectively. Similar results are obtained with the parsimonious fit measures taken in consideration. If we adjust the GFI by the number of paths in the model (parsimonious goodness of fit index (PGFI)) we achieve a good result, as it is greater than the recommended 0.50 level. Likewise, the parsimonious normed fit index (PNFI) and the parsimonious comparative fit index (PCFI) are both closer to 1, which indicates a good fit of the model (Mulaik et al., 1989).

All the analysed GFIs for the structural model are acceptable, thus we can proceed with the analysis of the parameters estimation and its implications for the hypotheses formulated. To validate the hypothesised effects, the estimated coefficients are examined. Table 4 shows each hypothesised relationship with the value of the associated regression weight, and its significance in the structural model. All estimates are positive and significantly different from zero for a level of significance equal to 0.01. These results indicate that the hypotheses are supported.

The results show that the expected causal links between TAM observed and unobserved variables are statistically different from zero: *attitude towards use* has a positive and significant impact on *continuance intention* ($\beta = 0.87$, $p < 0.01$); likewise, *perceived usefulness* has a direct effect on *attitude towards use* ($\beta = 0.66$, $p < 0.01$); and *perceived ease of use* positively influences *perceived usefulness* ($\beta = 0.29$, $p < 0.01$) and *attitude towards use* ($\beta = 0.14$, $p < 0.01$). In the latter case the effect is direct, as well as indirect (mediated by *perceived usefulness* and *flow*).

Consistent with our hypotheses, *perceived didactic resources quality* has a positive, significant, and direct impact on *perceived ease of use* ($\beta = 0.46$, $p < 0.01$), *perceived usefulness* ($\beta = 0.49$, $p < 0.01$), *flow* ($\beta = 0.13$, $p < 0.01$), and *presence* ($\beta = 0.26$, $p < 0.01$). Apart from these direct effects, there is also an indirect effect of this construct on *perceived usefulness* and *flow*, mediated by *perceived ease of use* in the first case, and by *presence* in the second case. And *instructor attitude* facilitates *perceived didactic resources*

Table 4. Hypotheses and structural model path coefficients.

Hypotheses and pathways				β	SE	CV	p
H1 (+)	Attitude towards use	→	Continuance intention	0.872	0.020	43.964	***
H2 (+)	Perceived ease of use	→	Attitude towards use	0.138	0.017	8.067	***
H3 (+)	Perceived usefulness	→	Attitude towards use	0.661	0.018	37.031	***
H4 (+)	Perceived ease of use	→	Perceived usefulness	0.293	0.025	11.836	***
H5 (+)	Resource quality	→	Perceived ease of use	0.456	0.024	18.868	***
H6 (+)	Resource quality	→	Perceived usefulness	0.487	0.026	18.643	***
H7 (+)	Instructor attitude	→	Perceived ease of use	0.076	0.024	3.242	0.001
H8 (+)	Instructor attitude	→	Perceived usefulness	0.084	0.023	3.664	***
H9 (+)	Instructor attitude	→	Resource quality	0.537	0.025	21.482	***
H10 (+)	Perceived ease of use	→	Flow	0.199	0.031	6.335	***
H11 (+)	Resource quality	→	Flow	0.130	0.030	4.324	***
H12 (+)	Flow	→	Academic performance	0.278	0.070	3.963	***
H13 (+)	Flow	→	Attitude towards use	0.066	0.010	6.579	***
H14 (+)	Resource quality	→	Presence	0.255	0.031	8.271	***
H15 (+)	Instructor attitude	→	Presence	0.088	0.033	2.669	0.008
H16 (+)	Presence	→	Flow	0.764	0.032	24.086	***
H17 (+)	Presence	→	Continuance intention	0.070	0.016	4.352	***

Note: β, estimates; SE, standard error of the regression weight; CV, critical ratio value for regression weight.
***$p = 0.000$.

quality ($\beta = 0.54$, $p < 0.01$), *perceived ease of use* ($\beta = 0.08$, $p < 0.01$), *perceived usefulness* ($\beta = 0.08$, $p < 0.01$), and *presence* ($\beta = 0.09$, $p < 0.01$). In addition, we observe significant indirect effects of *instructor attitude* on *perceived usefulness*, *perceived ease of use*, and *presence*, all of them mediated by *resource quality*.

Besides *perceived didactic resources quality*, *flow* is also influenced by *perceived ease of use* ($\beta = 0.20$, $p < 0.01$) and *presence* ($\beta = 0.76$, $p < 0.01$). In turn, *flow* has a positive effect on *academic performance* ($\beta = 0.28$, $p < 0.01$) and on *attitude towards use* ($\beta = 0.07$, $p < 0.01$). For its part, *presence* has a direct impact on *continuance intention* ($\beta = 0.07$, $p < 0.01$).

Summary and concluding discussion

Summary

The aim of this investigation was to develop a comprehensive model of user experience in e-learning that captures its outcome in terms of re-usage intention. Towards that aim, we have integrated theories from distinct fields, and analysed data of e-learning experiences. The results offer powerful support to the relationships embedded in the model.

Contributions and implications on research

Our investigation contributes to a more systematic understanding of users' experiences in e-learning, and does so in three ways. First, it offers new knowledge to the domain of e-learning experiences. The research delivers robust empirical support for our integrative model, not found in the literature until now. The model is more comprehensive than others built to explain e-learning continuance intention (Chiu & Wang, 2008; Joo et al., 2011; Lee, 2010; Lin, 2011; Roca & Gagné, 2008) since it jointly explains the effect of sense of presence, flow states, and perceptions of ease of use and usefulness, and it further considers the main specificities of the e-learning contextual environment.

The second contribution fills a gap in the literature in e-learning, which has addressed a great deal of effort at identifying key education components and strategies but has not connected these elements with users' behavioural intentions. Our research brings evidence about the crucial role played by two factors already explored by e-learning literature (perceived didactic resources quality and instructor attitude). It suggests that both are relevant antecedents of perceived ease of use, perceived usefulness, and presence; and that perceived didactic resources quality is, additionally, a predictor of flow. Furthermore, it clarifies how didactic resources and instructor attitudes indirectly impact on user's intention towards continued e-learning. We adduce that these two contextual aspects have tremendous potential to foster and empower users to utilise e-learning effectively, and engross users in the virtual education realm. Another striking finding is that the instructor attitude elicits perceived ease of use and, indirectly, flow. This shows for the first time the important role played by instructors in making the usage of the e-learning environment easier. And it allows conciliation between results found by Webster and Hackley (1997) – who, in their exploratory study, defended the potential of instructors to influence users' perceptions and cognitive immersion – and those yielded by Choi et al. (2007), who did not detect a direct effect of instructor on flow online. Added to this, we provide the first empirical support for the direct effect of quality didactic resources on presence.

The third contribution is made by extending current knowledge into the domain of e-learning. The results confirm the relationship between flow and objective academic performance, which in the past has only been observed for traditional education environments (Engeser & Rheinberg, 2008; Schüler, 2007). And although the research reproduces TAM connections between perceived ease of use, perceived usefulness, attitude, and intention, it offers new evidence about antecedents of user's utilitarian beliefs, and the causal link of perceived ease of use with flow. Unlike the few TAM extended models developed for e-learning continuance, which mainly considered technology-related variables as drivers of perceived ease of use and perceived usefulness (Cho et al., 2009; Roca et al., 2006), we illustrate the role of virtual education's elements as prior factors. And we contribute to the discussion about the direction of the causal link between flow and perceived ease of use (Sun & Zhang, 2008) by offering similar results to Tao et al.'s (2009) for e-learning continuance. On top of this, our results support that user's utilitarian perceptions, as well as cognitive states of flow, are influential components of e-learning experiences, and that, mediated by attitude, all lead to user continuance. Moreover, presence is found to directly influence behavioural intention, as theoretically assumed by Joo et al. (2011). Importantly, and to the best of our knowledge, all these relationships have been tested and supported among one of the largest samples of e-learning users ever.

Managerial implications

Our analysis helps instructors and education institutions to design mechanisms that prevent the discontinuation of e-learning, and raises opportunities for user retention. It identifies elements that can make a difference to e-learning experiences, and add value for users. The results show that technological features per se no longer determine e-learning continuance. Rather, components of virtual education environment – didactic resources, together with instructor attitudes – tend to be of paramount importance for users. This is a vital point as it illustrates that the relevance of target technology lies in the pedagogical benefits derived from its use. In fact, the two education components considered here have a substantial impact on users' experiences. Not only do they elicit the user's perceptions about the utility of the virtual environment, but also the user's cognitive immersion in his or her

learning processes. Add to this mix, instructor attitudes unleash the user sense of presence. So instructors and staff responsible for designing and managing e-learning programmes should be vigilant of these education components, and ensure that they are displayed with high levels of quality, from the user's perspective.

The considered elements of virtual education, influential though they might be, have different roles in users' experiences. Didactic resources have a much more direct impact, than that of instructor attitude, on perceived ease of use, perceived usefulness, flow, and presence. But a positive instructor attitude determines, largely and unambiguously, the development of quality didactic resources. Consequently, it is advisable for education institutions committed to user retention to address their efforts to kit out their e-learning programmes with current, adapted content. And the best approach for achieving this involves stimulating a student-centred culture among instructors, and providing them with (material and intangible) mechanisms to facilitate their involvement in creating and maintaining high-quality didactic resources.

Our investigation points out two sources to enhance the learning experiences and raise favourable attitudes, which will end up triggering users' continuance. First, the perceived ease of use and the perceived usefulness of the virtual education environment are still relevant. A clear, comprehensible, flexible, and pertinent virtual education environment helps users achieve their learning goals, so it facilitates positive attitudes. Consistent with previous research, perceived ease of use plays a less significant role on attitude than perceived usefulness, which suggests that a lot of focus should be on the education elements that make e-learners exceptionally effective in their tasks. Second, and like the perceptions of utility, mental states of flow improve the user's experience. This suggests that e-learners are not merely oriented by instrumental values but also value feeling the excitement and pure joy of learning. The user engagement in states of flow, therefore, should be acknowledged and promoted throughout the education institution. Instructors and staff managers should work together to increase the users' interest in learning, and make available those elements that engage e-learners in tasks that let them enjoy the experience of learning. As seen, flow will also facilitate a higher academic performance.

A final source of value for institutions lies in the presence component of the e-learning experience. No matter what the individual's attitude to the virtual education environment is, if he or she feels placed in this particular realm, he or she will be more willing to continue e-learning. This suggests that instructors and staff managers should facilitate initiatives that enable users to feel they are in a true education environment – one where they can constructively build knowledge.

Limitations and opportunities for further research

This investigation is not exempt from a number of limitations; consequently this offers opportunities for future research. First, as with many other empirical studies in e-learning, data were collected at only one institution. It is worth highlighting that respondents came from a variety of backgrounds and took degree courses across a spectrum of disciplines. Further research might go beyond the present general analysis of user experiences in pure-online environments and extend it to particular e-learning programmes, across blended and pure-online modes. Second, participation in the survey was voluntary and thus subject to self-selection bias. Despite this, difference of means tests indicated that participants did not differ significantly in age, genre, and degree programme studied from those at the sample frame, so non-response bias was unlikely. A Harman's single-factor test was run to assess common method bias. The factorial analysis produced five components with

eigenvalues greater than one, and the aggregate variance explained was 68.66%. This shows that the possible existence of common method variance should not significantly affect the interpretation of the results. Besides, the user's learning performance was measured objectively, which allows discarding a halo effect for this particular construct measurement. Last but not least, further research could use methodological approaches that capture actual users' behaviours online and tests the model in terms of actual behaviour.

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Appendix. Measures

Continuance intention:
(INT1) I am going to regularly use "the Campus" next semester
(INT2) I will strongly recommend others to use "the Campus"
Attitude towards use:
(AU1) Using "the Campus" is a good idea
(AU2) I like the idea of using "the Campus" for learning purposes
(AU3) Using "the Campus" for learning purposes is pleasant
Perceived ease of use:
(PEOU1) Learning to operate "the Campus" was easy for me
(PEOU2) I find it easy to get "the Campus" to do what I want it to do
(PEOU3) My interaction with "the Campus" is clear and understandable
(PEOU4) I find "the Campus" to be flexible to interact with
(PEOU5) Overall, I find "the Campus" easy to use
Perceived usefulness:
(PU1) Using "the Campus" I can improve my learning performance
(PU2) Using "the Campus" helps me achieve my learning goals
(PU3) Using "the Campus" I can improve my effectiveness in learning
(PU4) I find "the Campus" useful
Perceived didactic resources quality:
(PDRQ1) "The Campus" provides resources and content up-to-date

(PDRQ2) "The Campus" provides resources and content that exactly fit my needs
(PDRQ3) "The Campus" provides sufficient resources and content
Instructor attitude:
(IA1) Instructors are friendly towards individual students
(IA2) Instructors have a genuine interest in students
(IA3) Instructors make you feel welcome when you seek help or advice
Flow:
(F1) I have (at some time) experienced "flow" on "the Campus"
(F2) In general, how frequently would you say you have experienced flow when you use "the Campus"?
(F3) Most of the time I use "the Campus" I feel that I am in flow
Presence:
(P1) I forget about my immediate surroundings when I use "the Campus"
(P2) Using "the Campus" makes me forget where I am
(P3) After using "the Campus", I feel like I come back to the "real world" after a journey