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The determinants of teachers' continuance commitment to e-learning in higher education

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Abstract
Technological evolution involves a challenge for teachers and higher education institutions to achieve e-learning success. This paper addresses this issue from the teachers' perspective to reveal what characteristics of the e-learning system affect teachers' continuance commitment and contribute to the increase and permanence of e-learning programmes. This study investigates possible relationships among intrinsic and extrinsic variables (self-efficacy beliefs, system quality and organisational impact) and teachers' continuance commitment. Based on previous information systems and e-learning research literature, this study presents an extended version of the Information System Success Model. The PLS-SEM method was employed to analyse the data collected from a probabilistic representative sample of 90 online teachers, 54% of them are male from different ages and teaching disciplines, and 78.6% of them are full-time teachers. Results show that having a well-established learning management system in the institution reinforces the instructors' commitment. Institutions should build a learning environment that fits instructors' needs, develop a creative, collaborative, secure, friendly and up-to-date platform with quality interactions between learners and instructors. Apart from offering good system quality and technical assistance, perceived organisational impact reveals as a key to achieving teachers' commitment to e-learning.

Keywords E-learning · Higher education · Teachers' commitment · Institutional support

1 Introduction

The evolution of Information and Communication Technologies (ICT) has profoundly affected higher education institutions, particularly since the creation of e-learning technologies that aim to be the teaching platforms of the future (Özyurt and Özyurt

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2015). E-learning is a web-based learning activity developed in a complex ecosystem that integrates technology and teaching techniques to produce an innovative educational format (Cidral et al. 2018). This teaching and learning activity occurs through the use of a Learning Management System (LMS), an interactive and immediate platform on the internet designed to create a high-quality learning experience (Mohammadi 2015). This platform provides students access to resources and services, promoting the development of a distance partnership between the participants (Aparicio et al. 2016).

These participants no longer maintain the traditional roles followed in offline education. The teacher (also, in this research, "instructor"), who in a traditional education setting was usually considered the primary source of information, becomes a facilitator of a wide range of learning resources, and the students become active participants in the development of knowledge (Udo et al. 2011). This implies a collaborative effort between students and teachers in a relationship that is no longer limited by time and space (Roca and Gagné 2008). Therefore, it becomes necessary for the participants to acquire a personal commitment to this educational tool to enrich their experience. Committed users have a better understanding of possible technological and pedagogical issues in e-learning and are aware of the importance of facilitating active, constructive and interactive communication through an LMS (Kong and Song 2015).

Successfully implementing an e-learning system in higher education institutions is a long process that requires significant time and effort to plan and organise the Learning Management System (LMS). The success of implementation also requires institutional support, that is represented by a substantial financial investment (Nichols 2008) and by the institutional recognition of the dedication (McGill et al. 2014). Moreover, the system quality, the teachers' perceptions about themselves and their continuance commitment have critical importance in this aspect, as their long-term use of the system is essential for the success of an LMS (Venkatesh and Bala 2008). However, studies that focus on online teachers' views are scarce and rarely explore their continuance commitment to this educational format (Almarashdeh 2016; Ćukušić et al. 2010; Margalina et al. 2014; Reyes Jr et al. 2017).

To answer the latest calls for research regarding the need to explore the teacher's perspective (Luo et al. 2017; Reyes Jr et al. 2017; Song et al. 2016), and inspired by the research gap mentioned above, this study is presented. Concretely, this paper aims to examine the drivers of online teachers' continuance commitment to the e-learning system by proposing a model that empirically tests the effect of the online instructors' self-efficacy beliefs, system quality, institutional support and organisational impact on their continuance commitment. By building on and extending prior work within this broad topic, we expect to answer the following research question: Do instructors' self-efficacy, system quality and institutional support affect perceived organisational impact and teachers' continuance commitment with/to e-learning?

2 Literature review

2.1 Continuance commitment

Over time, many researchers have studied how to improve the organisational efficiency and competitiveness (whether in a company, an institution or a political organisation) and they concluded that the workers' commitment to the organisation is a vital

predictor of the successful performance of it (Farid et al. 2015). Continuance commitment is defined as a psychological state that characterises the relationship between an employee and an organisation, and it reflects the recognition of costs associated with leaving the organisation (Meyer and Allen 1991).

This commitment has been widely studied in human resources and job contexts; as a result, research on commitment in industrial settings is ample (Yahaya and Ebrahim 2016). Expressly, in organizational literature, commitment is well acknowledged as a critical success variable that influences individuals behaviours (Meyer and Parfyonova 2010) and intention to stay (Chew and Chan 2008) among others (Chughtai and Zafar 2006). Moreover, literature has found that this commitment has consequences in the employee intention to continue or not in the organisation (Allen and Meyer 1993).

As a result, this aspect has also attracted the interest of educational researchers, who have shed light on teachers' commitment and have confirmed the importance of this variable in traditional higher education. As antecedents of teachers' commitment, for example, the findings of Nawab and Bhatti (2011) supported a strong relationship between financial compensation and this variable. Additionally to economic reasons, Choong et al. (2011) confirmed the role of the teachers' intrinsic motivation as determinant of commitment. Similarly, Lew (2009) stressed the importance of organisational support, in terms of recognising teachers' contributions and caring about their well-being, on their commitment. Besides, Anitha and Reema (2014) found that instructors with more professional competency (i.e. the ability to master the knowledge) are more committed towards their institution.

2.2 The importance of continuance commitment to e-learning

Although teachers' commitment has been mainly studied in traditional education contexts, the knowledge of this aspect in the online education context is more limited. In this sense, to date, several studies have analysed the initial acceptance of an e-learning system, as such acceptance was originally considered the essential variable to assess the likelihood of success of new technology (Venkatesh et al. 2012). However, the latest research suggests that to consider an e-learning system as successful, it is necessary that users develop a personal continuance commitment to it (Mirabolghasemi et al. 2019). Continuance commitment implies that after the initial acceptance of an LMS, users intend to continue their learning or teaching activity in this format (Kang and Lee 2010). The initial adoption of an information system (IS) does not necessarily mean that the user is going to continue employing it in the future (Bhattacherjee 2001). Due to the effort that must be made to develop an IS such as an LMS, it is essential to retain existing users of that technology, or, as Luo et al. (2017) conceptualise, create *stickiness* to the e-learning system.

Continuance commitment is driven by users' cognitive beliefs, and it is useful for predicting their future behaviour (Malhotra and Galletta 2005). In the complex universe of e-learning systems, those beliefs are formed through a myriad of extrinsic and intrinsic factors that can affect users' overall experience. In an effort to understand those factors, the literature has developed a large number of structural models and questionnaires designed to measure them (Abdullah and Ward 2016). For instance, the Information System Continuance Model (ISCM) developed by Bhattacherjee (2001) was adapted to study continuance commitment but considering mainly system adoption variables (Liu et al. 2015). Likewise, prior researchers have drawn on different theories,

for example, the case of Khurram (2009) who based her model on social exchange theories, namely the Organizational Support Theory and the Psychological Contract Theory. Moreover, other authors have done different proposals of questionnaires and models based on their literature review (e.g. Ma et al. 2012). In other cases, different kind of predictors, such as personal characteristics, job-related factors and job involvement factors, have been considered to build the models (Joiner and Bakalis 2006).

In this research, an extended version of the Information System Success Model (ISSM) was created to examine the post-adoption phase of e-learning systems on teachers of higher education institutions. The ISSM, originally developed by DeLone and McLean (1992), is one of the most widely accepted and employed models used to identify the essential characteristics of an information system and to examine how these factors can affect users' initial acceptance of the system. This model presented five dimensions of success: system quality, information quality, use, user satisfaction and organisational impact. This research was subsequently updated by Gable et al. (2008), who stated, consistent with contemporary views on IS and other disciplines, that satisfaction can be conceived as a consequence of success rather than a dimension of it. In an e-learning context, the ISSM has to be adapted due to the multiplicity of actors involved and the characteristics of the IS, which in this case is specifically designed to create an online learning space (Ćukušić et al. 2010; Löfström and Nevgi 2007).

Several studies have adapted the ISSM to the modern e-learning reality (Aparicio et al. 2017; Cidral et al. 2018; Uppal et al. 2018; Dağhan and Akkoyunlu 2016; Mohammadi 2015; Hassanzadeh et al. 2012; Almaiah and Alismaiel 2019; Ghavifekr and Mahmood 2017), establishing it as a reliable model to understand an LMS' contributions to the e-learning educational process. However, ISSM's use is limited to the extrinsic factors that can motivate users' continuance commitment to an LMS. Recent literature has highlighted the importance of examining intrinsic factors involved in online education and specifically of observing how those factors can affect online teachers' continuance commitment (Hung et al. 2011).

3 Research hypotheses

3.1 The organisational impact of e-learning

The implementation of a high-quality information system in an organisation affects the working process of its members, and it also promotes global improvements to the institution (Cao and Elias 2009; Kimiloglu et al. 2017). It has been suggested that the perception of a positive impact on the organisation is a factor that could enable e-learning initiatives to be 'sold' to colleagues, developers, and management (McGill et al. 2014). In an e-learning context, the *organisational impact* is defined by how an LMS has promoted an improvement in the global organisational results (Gable et al. 2008), measured in terms of augmented competitiveness, improved service quality, or enhanced communication between users (Ashrafzadeh and Sayadian 2015).

In previous research, the organisational impact has shown a more acute effect on instructors than it has on students, as instructors have intense personal concerns about this innovation and its consequences on their work-life (Ashrafzadeh and Sayadian 2015). This aspect of ISSM is undoubtedly an instructor's concern because the

instructors' continuance as online teachers partially relies on the positive impact the information system produces in the organisation. This variable has been studied previously in the private sector to measure the organisational impact of e-learning programmes (Kimiloglu et al. 2017; Cao and Elias 2009). Previous research suggests that the implementation of an e-learning system is beneficial in terms of organisational impact as long as it improves the quality of teachers' performance. Teachers' continuance commitment to an e-learning system has proved to be driven by their perceptions of high-quality work-life (Farid et al. 2015) and a positive impact of the e-learning system in the organisation (Alkhalaf et al. 2012). The null hypothesis (H_o1) suggests a non-significant effect of organisational impact on continuance commitment, and it is the opposite of the alternative hypothesis (H_a1). Then:

> H_o1: Organisational impact does not influence teachers' continuance commitment to the e-learning system.
> H_a1: Organisational impact influences teachers' continuance commitment to the e-learning system.

3.2 Drivers of continuance commitment and organisational impact of e-learning

Teachers' commitment is partially based upon personal beliefs and image of the self, as well as the teachers' perception of their roles and identities as instructors (Day et al. 2005). *Teacher's self-efficacy* beliefs are related to "their own abilities to successfully perform specific teaching and learning tasks within the context of their own classrooms" (Dellinger et al. 2008).

In an e-learning context, teachers' tasks include supporting student autonomy and facilitating content comprehension, as well as promoting engagement in collaborative learning and reducing technological limitations (Fryer and Bovee 2016). For that reason, online instructors are usually valued in accordance with characteristics such as their capacity to understand the individual needs of each student and to give personalised attention to them (Stodnick and Rogers 2008). Following previous literature, the determinant characteristics to measure teachers' quality in e-learning contexts are instructors' assurance, empathy and responsiveness (Petruzzellis et al. 2006; Udo et al. 2011). *Instructors' assurance* is an indicator of the teacher's knowledge and skills that inspire confidence as a professional (Stodnick and Rogers 2008). This variable is one of the most important to evaluate teachers' quality, as it measures the ability, clarity, and mastery of course content on the part of the instructor. *Instructors' empathy* includes concern and individualised attention that teachers offer to their students to encourage them to share their ideas and use their critical thinking in educational planning (Akhlaghi et al. 2012). Likewise, *instructors' responsiveness* reflects the willingness to help students and provide prompt service (Uppal et al. 2018).

Although some factors are similar in both offline and online environments, in the e-learning system, instructors' availability and response time are often considered as important as other factors, such as advanced technology or course design (Liaw et al. 2007). Teacher quality has been noted, in addition to system quality, to have a positive effect on e-learning user satisfaction (de Araújo et al. 2016). In addition, teachers' self-efficacy beliefs have been suggested to be predecessors of their continuance

commitment to the job (Klassen and Chiu 2011). The null hypothesis (H_o2) suggests a non-significant effect of self-efficacy perception on continuance commitment, while the alternative hypothesis posits a significant effect (H_a2). Thus:

> H_o2: Instructors' perceptions of their self-efficacy as online teachers do not influence their continuance commitment to the e-learning system.
> H_a2: Instructors' perceptions of their self-efficacy as online teachers influence their continuance commitment to the e-learning system.

In addition to teacher quality, *system quality* is one of the most important factors that affect users' intention towards technological use of the LMS. In this model, the LMS' quality is formed by the following factors: educational quality, information quality, service quality and technical system quality (Mohammadi 2015).

Educational quality can be defined as the ability of the LMS to provide a proper learning environment for students and facilitate collaborative learning (Hassanzadeh et al. 2012; Kim et al. 2017). This aspect concerns the interactive capacity of the LMS and influences the users' perception of e-learning as a useful tool to learn (Wang and Chiu 2011). The *information quality* relates to the quality of the information that the students or the teachers can generate using the LMS (Mohammadi 2015). This information has to be complete, relevant, accurate and up-to-date to achieve a successful e-learning experience. This information constitutes students' educational bases for learning, and students need content that is understandable and adequate in all possible formats (manuals, slides, videos, forums, links…) (Aparicio et al. 2017). The *service quality* refers to the technical support users receive when they access the LMS and in the case of a problem with the technological infrastructure (W.-T. Wang and Wang 2009). To increase service quality, LMS personnel have to provide prompt and efficient tools to solve users' technical difficulties to augment user satisfaction with the e-learning platform (Wang and Chiu 2011). Finally, *technical system quality* is defined as the functional success, formed by the accuracy and efficiency with which the LMS reproduces and delivers the information (DeLone and McLean 1992).

A review of the literature on the ISSM has found that system quality shows a positive association with use, user satisfaction and net benefits of an LMS (Petter et al. 2008). System quality also has a positive impact on participants' intention to enrol in an e-learning educational programme (Mohammadi 2015; Almarashdeh 2016; Hassanzadeh et al. 2012). This initial acceptance and intention to use an information system are the predecessors of the post-acceptance phase of implementing new information technology (Bhattacherjee 2001). In an e-learning context, the continued use of an LMS over time creates a continuance commitment among its users. The research on post-adoption in the context of e-learning still needs future development (Shaikh and Karjaluoto 2015), but the initial results suggest that system quality affects the continuance commitment of students (Dağhan and Akkoyunlu 2016) and teachers (Zheng et al. 2013; Mohammadi 2015). The null hypothesis (H_o3) suggests a non-significant effect of system quality perception on continuance commitment, and it is the opposite of the alternative hypothesis (H_a3). So:

> H_o3. The e-learning system quality does not influence teachers' continuance commitment to the e-learning system.

H_a3. The e-learning system quality influences teachers' continuance commitment to the e-learning system.

The implementation of a high-quality information system has been proven to promote global improvements in the organisation (Kimiloglu et al. 2017; Cao and Elias 2009). According to Alkhalaf et al. (2012), a high-quality e-learning system creates a positive impact on higher education institutions, as it helps the institution save on education expenses and, according to the teachers, improves teachers' career performance within the institution. Service quality is suggested to be the variable with the most influence on organisational impact, followed by information quality and system quality (Gorla et al. 2010). The null hypothesis (H_o4) suggests a non-significant effect of system quality perception on organisational impact and the alternative hypothesis reflects the significant effect (H_a4). Therefore:

H_o4. E-learning system quality does not influence teachers' perception of a positive organisational impact of e-learning in the higher education institution.
H_a4. E-learning system quality influences teachers' perception of a positive organisational impact of e-learning in the higher education institution.

The *institutional support* that e-learning initiatives receive from the organisation refers to the financial support and the institutional recognition of the time and experience necessary to develop and maintain these initiatives (McGill et al. 2014). Universities are inclined to offer support to adapt to technology-enhanced learning strategies but are reluctant to accept the most disruptive techniques (Flavin and Quintero 2018). The literature has shown that institutional support is essential to reassure instructors of their role as online teachers, as instructors have shown certain reluctance to convert from onsite to online teachers. Instructors' concerns were focused on the demands of this type of teaching format, their adequacy as teachers to fulfil students' demands and their role in the e-learning process (Ashrafzadeh and Sayadian 2015). However, those concerns have been mitigated when there was a perception of institutional support for e-learning implementation (McGill et al. 2014).

The elaboration of supportive institutional policies is an essential factor to guarantee the sustainability of the initiative over time (Czerniewicz and Brown 2009; Nichols 2008; Salmon 2005). This institutional support augments the potential of an LMS to be used beyond the original development environment (Gunn 2010), and it has been proven to be one of the critical factors to ensure the continuity and development of e-learning initiatives in higher education institutions (McGill et al. 2014). Institutional support has been studied in previous research about motivation and behavioural intention to use an e-learning system. Such support has been empirically analysed in this paper for a better understanding of the mechanisms that influence e-learning programmes and of how the support impacts the organisation (Futris et al. 2015). The null hypothesis (H_o5) suggests a non-significant effect of institutional support on organisational impact, and it is the opposite of the alternative hypothesis (H_a5). Therefore:

H_o5. Institutional support for e-learning initiatives does not influence teachers' perceptions of a positive organisational impact of e-learning in the higher education institution.

H_a5. Institutional support for e-learning initiatives influences teachers' perceptions of a positive organisational impact of e-learning in the higher education institution.

All the previous reasoning and hypotheses are reflected in Fig. 1.

4 Data collection and instrument design

The questionnaire was designed employing scales from the previous literature to ensure the content validity of the measures. The questionnaire design contemplates three sections of 5-point Likert scales (from 1 = 'strongly disagree' to 5 = 'strongly agree'). The first section refers to instructor self-efficacy, a second-order construct, that consists of 3 dimensions (Kim et al. 2012; Udo et al. 2011): instructors' assurance, instructors' empathy and instructors' responsiveness. The second section refers to system quality, also measured as a second-order construct (Hassanzadeh et al. 2012; Mohammadi 2015). It consists of educational quality, information quality, service quality and technical quality, adapted from Mohammadi (2015). The third section includes 3 first-order constructs. Namely, institutional support which was adapted from McGill et al. (2014), the organisational impact from Alkhalaf et al. (2012), and continuance commitment from Kang and Lee (2010).

After selecting validated scales and with the intention of obtaining a representative sample, an online questionnaire was distributed among instructors of online subjects in online degrees of one Spanish higher education institution. The whole population of instructors that teach online at this university ($N = 126$) received the same opportunity to answer the survey and obtain by email a link to the online questionnaire that was asked to respond in a 15-day period. Since everyone in the population has an equal chance of being selected, a probability-sampling technique was employed. After the 15 days, only 90 of them answered the questionnaire thoroughly, subsequently two uncompleted questionnaires were discarded. Thus, the response rate concerning the population is 71.4%.

In order to know the sampling error, we used the formulas of sample sizes following prior literature (Cochran 1963; Krejcie and Morgan 1970). In this study, the method

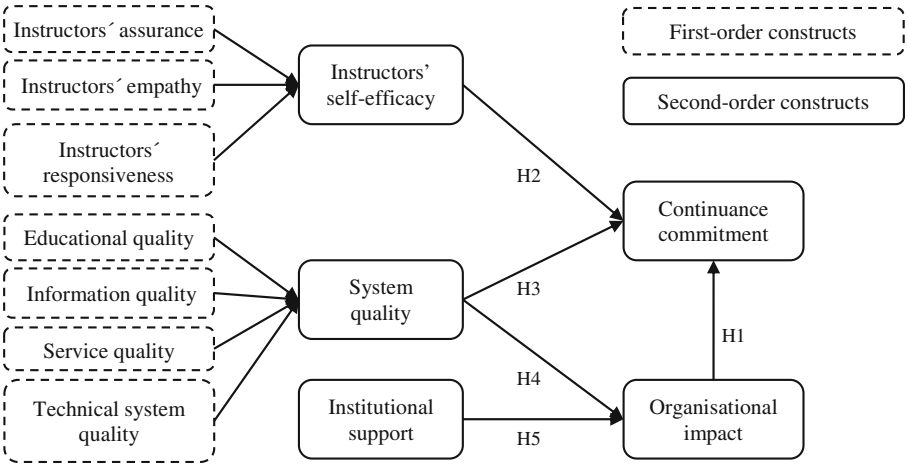

Fig. 1 Research model

recommended by Krejcie and Morgan (1970) for determining sample size error was employed. The calculus with the Krejcie and Morgan's (1970) formula shows a margin of error of 5.5% (confidence level of 95%) for the sample size.

The demographic characteristics of the sample are presented in Table 1. In addition, it is similar to the public data of the population profile, that is mainly male (52.1%), older than 39-year-old (77.7%) with a permanent contract with the university (44.8%).

In the next epigraph, the analysis is detailed. Precisely, Table 2 shows the first-order measurement model, and Table 3 shows the second-order measurement model, and include more details about the sources of the scales and the items.

5 Data analysis and results

The partial least squares (PLS) approach was used to analyse the data, employing the statistical programme SmartPLS 3.2.7 (Hair et al. 2017). This method can be employed to test the validity of reflective and formative constructs and is useful for small samples (Leguina 2015), and it is common to find this statistical analysis in the most recent research on e-learning systems (Aparicio et al. 2017).

Prior research (Barclay et al. 1995; Chin 1998; Marcoulides and Saunders 2006) highlights that PLS is appropriate software for parameter estimation in structural models and handling small samples. Specifically, Garson (2016) proposes two ways to determine the appropriateness of the sample size when the PLS bootstrapping approach is employed. First, fulfil these guidelines: at least 10 cases per measured variable for the larger of (1) the number of indicators in the largest latent factor block,

Table 1 Demographic characteristics of the sample

	Percentage
Gender	
Female	46.0%
Male	54.0%
Age	
>30	2.3%
30–39	19.8%
40–49	39.5%
50<	36.7%
Teaching discipline	
Political Sciences and Public Management	19.8%
Spanish: Language and Literature	14.0%
History and Patrimony	17.4%
Informatics engineering	26.7%
Tourism	22.1%
Contract with the university	
Permanent contract	69.4%
Temporary contract	30.6%

Table 2 First-order measurement model

Variable	Items	Weight	t - value	VIF	Tolerance
Instructors' self-efficacy (Udo et al. 2011)	*Instructors' assurance*				
	I consider myself fair and impartial in grading.	0.870	2.334	1.095	0.913
	I try to answer all the questions thoroughly.[a]	–	–	–	–
	I am sure that I have an expert understanding of the material.	0.299	0.650	1.095	0.913
	Instructors' empathy				
	I am genuinely concerned about the students.	0.131	0.291	1.388	0.712
	I understand the individual needs of students.	0.297	0.707	1.282	0.780
	I have the student's best long-term interests in mind.[a]	–	–	–	–
	I try to encourage and motivate students to do their best.	0.754	1.721	1.505	0.656
	Instructors' responsiveness				
	I respond quickly and efficiently to student's needs.	0.317	0.585	1.090	0.917
	I welcome students' questions and comments.	0.862	1.787	1.090	0.917
System quality (Mohammadi 2015)	*Educational quality*				
	E-learning provides incentives to the student.	0.190	1.733	1.657	0.582
	E-learning provides collaborative learning.	0.362	2.753	1.741	0.576
	E-learning provides required facilities such as chat and forum.	−0.040	0.294	1.454	0.685
	E-learning provides the possibility of communicating with other students.	0.101	0.656	1.539	0.647
	E-learning provides possibility of learning evaluation.	0.126	0.794	1.810	0.529
	E-learning provides a good learning style.	0.506	3.201	2.289	0.399
	Information quality				
	E-learning provides information that is relevant for the students' needs.	0.099	0.363	2.904	0.340
	E-learning provides complete information.	0.548	1.808	3.114	0.310
	E-learning provides the information the students' want.	0.757	2.434	3.795	0.257
	E-learning provides organised content and information.	−0.208	0.886	1.713	0.580
	E-learning provides up to date content and information.[a]	–	–	–	–
	E-learning provides required content and information.	−0.219	0.640	3.657	0.268
	Service quality				
	E-learning provides a proper online assistance and explanation.	0.540	2.445	1.527	0.653
	E-learning department staff responds in a cooperative manner.	0.246	1.148	1.163	0.858
		−0.043	0.203	1.688	0.587

Table 2 (continued)

Variable	Items	Weight	t - value	VIF	Tolerance
	E-learning provides the opportunity of reflecting views.				
	E-learning provides good management for the courses.	0.544	2.785	1.438	0.696
	Technical system quality				
	The e-learning platform is aesthetically satisfying.	0.214	0.895	1.910	0.494
	The e-learning platform optimises response time.	0.178	0.829	2.011	0.478
	The e-learning platform is user friendly.	0.230	0.789	2.870	0.342
	The e-learning platform provides interactive features between users and the system.	0.270	1.033	1.557	0.619
	The e-learning platform possesses structured design.	−0.011	0.056	1.477	0.669
	The e-learning platform has flexible features.	−0.068	0.264	1.544	0.642
	The e-learning platform has attractive features.	0.004	0.014	2.508	0.389
	The e-learning platform is reliable.	0.325	0.913	4.257	0.217
	The e-learning platform is secure.	0.143	0.488	3.014	0.324

[a] Deleted items

or (2) the largest number of incoming causal arrows for any latent variable in the model. Both are satisfied in this study. Second, employ a test for the adequacy of our sample size and detect the effect size. In this case, a power analysis was used (Faul et al. 2007), with the help of the G*Power software, because it is a recommended tool for estimated the population effect size (Peng et al. 2012; Thomas 1997). The use of the G*Power software reveals that a standard level of significance $\alpha = 0.05$, an effect size ($f2 = 0.15$) and four predictors, the power achieved for our sample size ($n = 90$) was 82.9%, which exceeds the recommended power level of 80% (Hair et al. 2017).

5.1 Measurement model

In this paper, the dimensions of instructors' self-efficacy and system quality are considered, due to their previous appearance in the literature research as formative second-order constructs created by three and four dimensions, respectively.[1] According to Bagozzi and Yi (2012), including a higher-order construct implies that measurement assessment needs to be undertaken at two levels. At the first-order level, in regard to the relationships between the observed variables and the latent variables in the model, all the variables are considered formative constructs.[2]

[1] *Higher Order Models or Hierarchical Component Models:* Dimensions with enough conceptual complexity to also be latent variables that need an indicator system (Hair et al. 2018).

[2] According to Haenlein and Kaplan (2004), a formative scale includes indicators that are the cause of the latent variable and are not interchangeable.

Table 3 Second-order measurement model

Variable	Items	Weight	t-value	VIF	Tolerance
Instructors' self-efficacy (Udo et al. 2011)	*Instructors' assurance*	0.565	1.937	1.256	0.750
	Instructors' empathy	0.693	1.377	1.881	0.494
	Instructors' responsiveness	−0.115	0.201	1.780	0.537
System quality (Mohammadi 2015)	*Educational quality*	0.758	6.017	2.175	0.457
	Information quality	0.134	0.962	1.847	0.519
	Service quality	0.107	0.732	2.425	0.394
	Technical system quality	0.114	0.925	1.860	0.496
Variable	Items of the formative constructs	Weight	t-value	VIF	Tolerance
Institutional support (McGill et al. 2014)	The University supports the continuance of this innovation.	−0.475	1.481	3.782	0.232
	The University supports the initiatives of innovation in e-learning.	0.274	1.150	3.308	0.277
	There is financial support for the ongoing development of the innovation.[a]	–	–	–	–
	There is technical support for the ongoing development of the innovation.[a]	–	–	–	–
	There are human resources for the ongoing development of the innovation.	0.360	1.504	1.536	0.593
	This innovation represents a competitive advantage for the University.	0.898	6.822	1.321	0.724
Organisational impact (Alkhalaf et al. 2012)	The e-learning system helps to improve teaching performance.	0.167	1.313	2.198	0.434
	The e-learning system helps the organisation save on delivery costs.[a]	–	–	–	–
	The e-learning system helps me think through problems.[a]	–	–	–	–
	The e-learning system helps the organisation enhance competitiveness.	0.321	2.218	2.531	0.382
	The e-learning system helps the organisation to respond more quickly to change.	−0.089	0.713	2.171	0.450
	The e-learning system helps to provide better teaching performance to the students.	0.423	2.856	2.406	0.403
	The e-learning system facilitates communication between users.	0.373	2.746	2.026	0.502
	The e-learning system helps the organisation to achieve its goals.	0.027	0.220	2.115	0.464
Variable	Items of the reflective constructs	Loading		t-value	
Continuance commitment ($\alpha = .807$, CR = .886, AVE = .725) (Kang and Lee 2010)	I would like to continue being an online teacher.	0.947		78.998	
	My intentions are to continue being an online teacher.	0.883		24.515	
	I prefer being an online teacher rather than being an offline teacher.	0.706		6.721	

[a] Deleted items

Table 2 shows the weights and multicollinearity of the formative dimensions. The weights represent the relative contribution in the formation of the latent variable. To analyse construct validity, item weights were examined (Petter et al. 2007). At this point, although several items' weights were not significant, following literature recommendations (Hair et al. 2017), the loadings of these items were checked and confirmed to have values above 0.5 and be significant. In addition, to discard any notion of multicollinearity for the formative scales, two tests were used: the variance inflation factor (VIF), whose acceptable values are below 5; and the tolerance index, whose acceptable values are above 0.10 (Hair et al. 2017). All the items that did not meet acceptable values for these tests were removed from the analysis, as the literature recommends (Hair et al. 2017).

Therefore, following literature recommendations (Hair et al. 2018; Wetzels et al. 2009), the previously validated first-order constructs (instructors' self-efficacy and system quality) could then be incorporated into the second-order measurement model.

In the second-order measurement model (Table 3), in addition to self-efficacy and system quality, institutional support and organisational impact are considered formative constructs, while continuance commitment to the e-learning system is considered a reflective construct. Regarding reflective latent variables, Cronbach α, CR, and AVE values confirmed the scales' reliability and validity, with values above 0.7, 0.6 and 0.5, respectively. As can be seen, all loading coefficients show significant values at a confidence level of 99% ($t > 2.57$). For the formative constructs, multicollinearity was ruled out, with VIF values below 5 and tolerance index values above 0.10. Regarding construct validity, item weights were examined (Petter et al. 2007). In this case, loadings were checked for item weights that were not significant, and we confirmed that they have values above 0.5 and are significant (Hair et al. 2017).

5.2 Structural model

After validating the measurement model, we tested the hypotheses by estimating the structural model. Discriminant validity was checked, as the square root of the AVE, in all cases, was higher than the correlation between variables (Fornell and Larcker 1981) (Table 4). Before supporting the proposed hypotheses, we analysed R^2 to confirm the explanatory power of the research. The results show that R^2 is acceptable because

Table 4 Correlation matrix

	Institutional support	Instructors' self-efficacy	System quality	Organisational impact	Continuance commitment
Institutional support					
Instructors' self-efficacy	0.295				
System quality	0.488	0.350			
Organisational impact	0.645	0.320	0.781		
Continuance commitment	0.343	0.290	0.612	0.663	**0.851**

Diagonal entry (in bold) is the square root of AVE; other entries are correlation coefficients

it exceeded 0.25 for organisational impact (0.702) and continuance commitment (0.466) (Hair et al. 2011, 2017; Henseler et al. 2016). The estimation of the completed structural model is shown in Table 5. Four of our alternative hypotheses were supported (H_a1, H_a3, H_a4, and H_a5), and only one alternative hypothesis (H_a2) was rejected.

6 Discussion

Our work supports the idea of addressing the teachers' perspective on e-learning development, a perspective that has been neglected in previous academic research, and it has been proven to have central importance (Song et al. 2016). This research supports and extends the ISSM model developed by DeLone and McLean (1992) as a valid instrument to analyse the e-learning reality not only for determining first-time acceptance but also for predicting the long-term sustainability of the initiative. Moreover, our approach extends this model to reach both extrinsic and intrinsic motivators, which offers a deeper understanding of the key drivers of teachers' continuance commitment. Prior research in traditional higher education contexts has primarily focused on few determinants of teachers' commitment related to specific aspects, such financial compensation (Nawab and Bhatti 2011) or ability to teach (Anitha and Reema 2014). Moreover, previous models that studied continuance commitment to e-learning have mainly included as determinants system adoption variables, such as usefulness and ease of use (Liu et al. 2015). In this case, a broader view is considered and key aspects related to teachers' intrinsic and extrinsic motivation are included as antecedents of this long-term relationship.

System quality remains the most essential factor that influences both organisational impact and, to a lesser extent, continuance commitment; these results are consistent with previous research (Hassanzadeh et al. 2012; Wang and Chiu 2011; Kim et al. 2012), among both students (Mohammadi 2015) and teachers (Almarashdeh 2016). Although service quality, information quality and technical quality are relevant factors to offer a good system quality, educational quality is considered the most important characteristic of an LMS according to the teachers, which is opposite to students' perspectives on previous research, as students consider this factor as the least significant in their use of an LMS (Mohammadi 2015; Kim et al. 2012). This result leads us to advise institutions to invest in the content, structure, and design of both the LMS and the educational content itself to achieve a successful e-learning system.

Table 5 PLS-SEM model (alternative hypotheses testing)

Path	Coefficient β	*P* Value
H_a1. Organisational impact → Continuance commitment	**0.467*****	0.000
H_a2. Instructors' self-efficacy → Continuance commitment	0.062	0.552
H_a3. System quality → Continuance commitment	**0.226**$^{+}$	0.064
H_a4. System quality → Organisational impact	**0.612*****	0.000
H_a5. Institutional support → Organisational impact	**0.346*****	0.001

Significant coefficients are in boldface. $^{+}p < 0.10$ $^{*}p < 0.05$ $^{**}p < 0.01$ $^{***}p < 0.001$

F^2 = H1 0.158, H2 0.006, H3 0.036, H4 0.957, H5 0.305

Following McGill et al. (2014), who suggested that institutional support is important for the sustainability of both e-learning programmes and the institution itself, our study goes further and confirm that the *institutional support*, materialised on the perception of the institution supporting innovation, initiatives and investing on resources to improve the system, lead to teachers' commitment to continue teaching online. This result contributes to the work initiated by Gable et al. (2008) and allows us to understand the relationship between e-learning and personal commitment. The instructors' subjective impression of this innovation as a helpful tool for an organisation to improve financially, offer better teaching and enhance competitiveness or communicate better, directly affects the instructors' continuance commitment. This commitment, as Aparicio et al. (2017) describe as personal "grit", is a characteristic that contributes to the long-term success of this innovation.

However, our findings show that *instructors' perceived self-efficacy* does not have a significant effect on their continuance commitment to online teaching. Previous research reveals that self-efficacy was found to be a driver of teachers' commitment to the teaching profession, generally considered, not only in the online context (González et al. 2018). Under other conditions, however, self-efficacy has not been significant for students' commitment to higher education online programmes (Sun and Rueda 2012). This apparent discrepancy suggests that self-efficacy is a factor that has inconstant importance in predicting continuance commitment among e-learning users. In our study, it can be that for the instructor it is not enough his/her perceived assurance, empathy and responsiveness to make a clear statement to desire and intent continuing teaching online.

6.1 Managerial implications

This study also has implications for policy. These results have an impact on the implementation of an e-learning system in higher education institutions. First, it seems essential to use and offer a high-quality system, since LMS quality is the best-evaluated characteristic from the instructors' perspective. Building a learning environment that fits instructors' needs contributes to creating a more useful platform with quality interactions between learners and instructors and better overall results in the learning process. Educational quality can be improved by establishing a proper application that facilitates collaborative learning, incorporating the implementation of chat and forums into the learning process. Other communication applications, such as online conferences or debates, could be useful in implementing an appropriate method of teaching that encourages instructors to develop a continuance commitment to the use of an LMS. Service quality in an LMS is also essential, which compels the institution to maintain an up-to-date online assistant and helpdesk, with involved technical staff that contribute to creating a successful platform. Technical system quality must be addressed by improving security mechanisms and the aesthetics of the learning platform to provide teachers with a safeguard to their private information and with a friendly and efficient system to develop their teaching work. Last, but not least, information quality can be improved by providing LMS-related information in a clear, comprehensive form, which must be relevant and updated for teachers´ interests.

Second, the institution should develop training programs to communicate the importance of e-learning and the positive impact that it has on the organisation since it can lead instructors to develop a commitment to the system, as has been empirically

corroborated in our study. Having a well-established LMS in the institution reinforces the instructors' commitment because it clarifies their status and responsibilities within the institution. Further, it ensures their position as online teachers and could motivate offline teachers to try the digital system. The institution is also responsible for ensuring instructors' effective usage of the e-learning system, for supporting the use of this system by expanding e-learning service, and for providing users with wide coverage, high speed of data transfer and high network bandwidth. Soliciting ongoing feedback from users to understand the concerns of instructors about the use of the LMS and showing instructors strong support from the institution is also recommended to improve the current system.

7 Conclusions, limitations and further research

The internet and ICTs have visibly changed educational technologies. E-learning systems have emerged from this evolution and spread rapidly, especially in higher education institutions (Udo et al. 2011). In this study, we present an extended version of the Information System Success Model to lead the research towards a deeper comprehension of the reasons and motivations of online teachers' continuance commitment to this educational innovation. As contributions to literature and using information from the online teacher's perspective, e-learning system quality and organisational impact reveal as key factors to make instructors motivated and willing to continue teaching online, whereas the mere fact of feeling capable of teaching well is not enough to desire to continue doing it.

The generalisability of results is limited due to the collection of information from one Spanish university. Moreover, this study discusses extrinsic and intrinsic motivators of teachers' continuance commitment but fails to provide a consistent explanation for the influence of teachers' self-assessment, which must be analysed in further research along with other constructs such as professional experience, autonomy support, structure or control (González et al. 2018). A wider sample of teachers from different universities would help to improve this study.

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