



How does Identity Theory contribute to the Continuance Use of E-learning: The mediating role of Inertia and moderating role of computer Self-efficacy

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Abstract

Despite e-learning's rapid growth and significant benefits, especially during the COVID-19 pandemic, retaining students in this educational environment is a critical challenge in the post-corona era. Therefore, our research was conducted to explore how we can promote the continuance use of e-learning (CUEL) platforms. More specifically, this study examines how identity, inertia, and computer self-efficacy affect CUEL. Data were collected from 384 users and provided support for the model. The results indicated that social identity, relational identity, and inertia are critical determinants of CUEL. Furthermore, inertia mediates the relation between social identity and CUEL. In addition, we found that computer self-efficacy moderates the relation of inertia and relational identity with CUEL, but its moderating effect on the influence of social identity and CUEL is not supported. Finally, the theoretical and practical implications of this study are discussed.

Keywords E-learning · Continuance use · Social Identity · Relational identity · Inertia

1 Introduction

The COVID-19 pandemic caused a sudden shift to online learning in most universities (Shirish et al., 2021). The spread of the COVID-19 pandemic has led to deep changes in social interactions and organizations, and the education system has not been protected because it led to the closure of higher education systems around the world (Murphy, 2020). In contrast, e-learning was prior seen as an optional and non-compulsory way to render lectures and provide skill training for educators. Neverthe-

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less, today, due to the COVID-19 pandemic, e-learning has become the salvation of higher education (Müller et al., 2021). One of the significant benefits of this approach is learning and training anywhere and anytime (Chang, 2016). It means technologies have transformed the customary way of education into the modern way of learning (Di Vaio et al., 2020). E-learning is roofed under a more extensive term of technology-based learning through learning portals, mobile apps, and thousand sorts of available websites for combined learning tools (Shahzad et al., 2021).

Continuance use of e-learning refers to the user's subsequent use of e-learning after the first experience (Chen et al., 2021; Şahin et al., 2022; Tawafak et al., 2021). However, little is known regarding why numerous users discontinue their e-learning after a prior experience (Sun et al., 2008). With the advent of COVID-19, CUEL again came to the fore. With the disease outbreak, there has been a rapid move towards e-learning, commonly referred to as emergency e-learning. This type of training does not involve long-term structured planning other than the purposeful e-learning efforts developed (Müller et al., 2021). Therefore, emergency e-learning programs consider appropriate crisis response measures (short term) (Murphy, 2020) but not long term.

Despite conducting various research using different models (Akbari et al., 2022; Bhattacharjee, 2001b; Cheng & Yuen, 2018; Lee, 2010; Mehta et al., 2019; Tha et al., 2009; Pereira et al., 2015; Roca et al., 2006), CUEL has always been a significant challenge in the education system. Because there is no special educational approach in the field of e-learning and most people have to learn by themselves. This type of learning mechanism limits learners' exchanges and affects the quality of learning effects (Oo Tha et al., 2009). Therefore, it is necessary to make appropriate plans to promote CUEL. Based on this, it is important to know the factors affecting CUEL. In the literature of e-learning systems the identity theory (Brewer & Gardner, 1996; Pan et al., 2017), inertia (Park et al., 2017; Amoroso et al., 2017; Wang et al. 2019b), and computer self-efficacy (Hayashi et al. 2004; Huang & Ren, 2020) regarding CUEL has been more or less paid attention to, but not in a coherent and integrated way. Therefore, considering the importance of these three elements, it is vital to focus, recognize and how they work on CUEL.

Information systems use (e.g., e-learning) is constantly associated with various social interactions and communication (Baber, 2021). Users' decision to participate in this platform, in addition to individual factors (Ray et al., 2014), depends on their perception of themselves (Muthuprasad et al., 2020), which is due to interaction with educators and peers (Ray et al., 2014). According to the literature, Social Self-Identity (SSI) is used to examine how users interact with others at two different levels. Social Identity (SI) is shaped by a joint aim, theme, or fondness, and Relational Identity (RI) shaped by a sense socially or feeling dependent to specific members (Brewer & Gardner, 1996; Pan et al., 2017). Although the two identities differ in their centers and motivation roots (relationship versus group) (Brewer & Gardner, 1996), researchers suggested that they should be studied together in investigations of general and differential individual behavior (Sluss & Ashforth, 2007).

Inertia is another variable that affects the acceptance and use of information systems (Park et al., 2017; Amoroso et al., 2017; Wang et al. 2019b). However, little is known regarding how inertia mediates the relationships between SSI and CUEL. Thus, in addition to considering the direct effect of the inertia on CUEL, we use

this variable as a mediator between SSI and CUEL. Finally, computer self-efficacy (CSE) is reflected as a moderating variable in the CUEL (Hayashi et al. 2004; Huang & Ren, 2020). Self-efficacy is considered one of the essential features to increase people's participation in e-learning (Chen, 2017). A user with low self-efficacy sees work as stressful; while a user with high self-efficacy mainly considers pressure to be a challenge, so it brings the individual potential to overwhelm the barriers (Jex & Bliese, 1999). Therefore, students' computer self-efficacy is a vital feature of CUEL (Hayashi et al. 2004). Consequently, the purpose of our paper is to assess how the influence of SSI by emphasizing the mediating role of inertia and the moderating role of CSE in the process leading to CUEL.

This work contributes to theory and practice in different veins. First, this study, unlike other studies in the field of CUEL, has developed a unique model of CUEL with a combination of the information system continuance model (Bhattacharjee, 2001a) and SI (Tajfel, 1974), RI (Shapiro, 2002), inertia (Newton, 1819), and CSE (Bandura, 1999) variables, to examine students' behavior in regards to CUEL, which has not been widely explored in the literature. Second, we use inertia as a mediating variable (Wang et al., 2019b; Polites et al., 2012) and CSE as a moderator (Compeau & Higgins, 1995; Hayashi et al., 2004; Peng et al., 2006; Chien, 2012; Liu & Hung, 2016) to better comprehend CUEL. Finally, the results of the research have implications for students, e-learning infrastructure service providers, and educational managers who seek to continue the use of e-learning.

The structure of this study is prepared as follows. The literature is reviewed in the second section in the form of a theoretical model and hypothesis development. Data and methods including data collection, method, item measurement, validity, reliability, and common method biases are found in Sect. 3. The findings are shown in Sect. 4, followed by discussion, implications, limitations, and future directions in Sect. 5. The conclusion is presented in Sect. 6.

2 Theoretical model and hypothesis development

2.1 Continuance use in e-learning

Many educational institutions and corporate organizations embrace e-learning to provide learning and increase training efficiency (Govindasamy, 2002; Lin, 2011; Siagian et al., 2020; Nariman, 2021; Nacher et al., 2021). In the past decades, the focus of studies was on the acceptance of new technologies (Lai & Li, 2005; Lin, 2011). However, in the last decade, the focus on this subject has shifted from primary use to continuance usage decisions (Ambalov 2018; Furneaux et al., 2011) because real success requires continuance usage (Lee, 2010). In information systems and e-learning context, initial use is only the first step towards success which ultimately depends on the continuance of use (Bhattacharjee, 2001; Ambalov, 2018). In unfortunate events (e.g., the COVID-19 pandemic), continuance use of the e-learning approach is vital for the educational systems because focusing only on the initial use may lead to high dropout rates (Panigrahi et al., 2018). CUEL mentions the sustained use of technology by students over the long term after their first use (Yoon & Rolland, 2015).

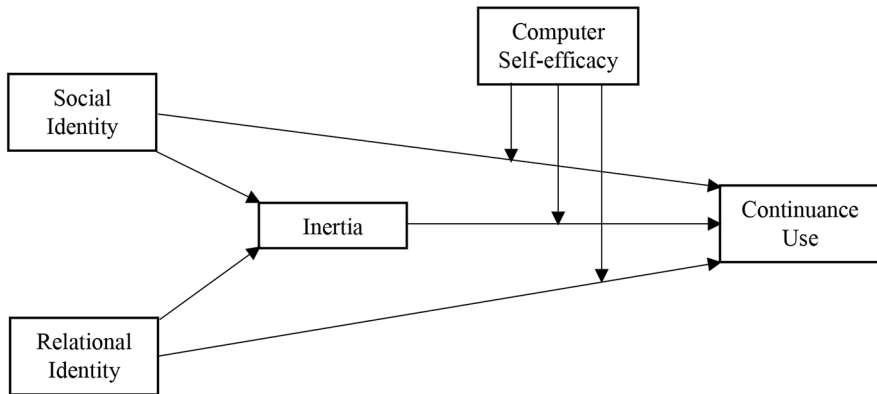


Fig. 1 Theoretical model

The information system continuance model draws from the marketing literature (Oliver, 1980). The model is the central theory explaining information technology continuance behavior, developed by Bhattacherjee (2001). The major theory of this model is the Expectation-Confirmation Theory, which has been applied using auxiliary theories and empirical findings in various fields including e-learning (Roca et al., 2006; Sørebo et al., 2009; Pereira et al., 2015; Yoon and Rolland, 2015; Dalhan & Akkoyunlu, 2016; et al., 2020). Continuance use in an e-learning and online courses setting has been the subject of increasing interest in recent years (e.g., Ansong-Gyimah, 2020; Basnet et al., 2018; Gelderblom et al., 2019; Joo et al., 2017; 2018; Rekha et al., 2022; Wang et al., 2021; Wu & Chen, 2017). In this study, unlike other studies, a new model of continuous use of e-learning is presented in Fig. 1.

2.2 Social and Relational Identity

The notion of SSI is used to investigate how students realize to use e-learning at two distinct levels, including SI and RI. SI maintains that individuals sort their lives into social groups and then categorize themselves into these groupings. SI is “that part of an individual’s self-concept which derives from their knowledge of their membership of a social group (or groups) together with the value and emotional significance attached to that membership” (Tajfel, 1978). In other words, it provides a framework for explaining intergroup behavior and intergroup communication based on the inherent value humans place on social group memberships, and their desire to view their specific social groups in a positive light (Harwood, 2020). SI examines the process and influence of intergroup division, RI proposes a model to explain the degree and quality of intergroup association (Shapiro, 2010). RI goes beyond neat social categorizations of ‘us’ and ‘them’ toward a dimensional, dynamic understanding of interpersonal and intergroup relations (Shapiro, 2010). This concept is based on the premise that individuals are interdependent (Zeng, 2020).

SI has had a remarkable impact on interpersonal and intergroup research (Giles & Byrne, 1982; Harwood et al., 2005; Martiny & Nikitin, 2019), mass communica-

tion context (Harwood 1999; Harwood, 2020), organizational and leadership studies (Reicher et al., 2005; Zhang et al., 2014; Loi et al., 2014; Steffens et al. 2021), social media (Jiang et al., 2016; Pan et al., 2017; Dutot 2020; Elsayed, 2021), and online games (Kaye et al., 2017; Liao et al. 2020). This is true in the research of RI, including organizational and leadership studies (Zhang et al., 2014; Niu et al. 2018), content and language integrated learning (Pappa et al., 2017), social media use (Pan et al., 2017), socio-political studies (Zeng, 2020), as well. Also, Ahmad and Khalid (2017), Ren et al. (2012), and Sassenberg (2002) showed that SSI influences people's intentions. Considering the effects of SI and RI in different fields of social sciences and also the research of Tha et al. (2009) on the influence of social ties on CUEL, we proposed the following two hypotheses:

H1 SI has a significant impact on CUEL.

H2 RI has a significant influence on CUEL.

2.3 Inertia

In Merriam-Webster Dictionary, inertia is defined as “indisposition to motion, exertion, or change.” In addition, inertia mediates the relationship between psychological characteristics such as attitude and continuance use (Polites & Karahanna, 2012; Park et al., 2017; Amoroso et al., 2017; Wang et al., 2019b). Inertia originated from Newton's first law of motion in physics (Cui et al., 2021). The conceptualization of inertia originates in the Status Quo Bias perspective (Seth et al., 2020). The marketing literature mainly uses the term inertia as one of the aspects of the notion of brand loyalty (Jeuland, 1979; Bawa, 1990; Greenfield, 2005; McMullan, 2005; Seth et al., 2020; Cui et al., 2021). That means inertia can potentially lead to loyalty (Seth et al., 2020).

In the information system literature, individual inertia has received little attention (Polites & Karahanna, 2012). In general, products/services use increases the probability of using them on the next occasion (Bawa, 1990). This tendency has been referred to as inertia (Jeuland, 1979; Bawa, 1990). This desire is the feedback of using the products/services or/and the users' need for those products/services (Shugan, 1980; Bawa, 1990) because they probably have no other choice. In general, multiple factors can lead to inertia, such as uncertainty, convenience, habituated decision-making, and loss aversion (Lee & Joshi, 2017).

According to Polites & Karahanna (2012), in the information system context, individual inertia is user attachment to, and persistence in, using a current system, even if there are better alternatives or incentives to change. Inertia exemplifies a rigid continuance of the current status (Polites & Karahanna, 2012). Pan et al. (2017) believed inertia can be divided into cognitive and effective concepts. The inertia of cognitive-based refers to a person deliberately continuing to make the same decision, albeit he/she is aware it may not necessarily be the most efficient or the most effective way of doing things. The inertia of affective-based refers to when a person steadily uses a system because he/she pleasures it, senses stress to shift, or is comfortable doing so.

Due to the COVID-19 Pandemic and the compulsion to move from face-to-face training to e-learning as well as its continued use (Anuragini et al., 2021; Müller et al., 2021; Murphy, 2020) in this study, the inertia of the cognitive approach has been considered. Wang et al. (2019b) showed that inertia, in addition to having a direct effect on the intention to continue, plays a role as a mediating variable. Polites & Karahanna (2012) discussed that inertia plays a role and directly affects the acceptance of technology. In addition, their study showed that inertia mediates the relationship between the motives to continue using the incumbent system and acceptance of the new system. The literature shows that the interaction quality (Wang et al., 2019b) and access convenience (Cheng et al., 2011) affect inertia. Also, Cui et al., (2021) showed that individual attributes affect inertia. Thus, the following five hypotheses were proposed:

H3 Inertia has a positive influence on CUEL.

H4 SI has a significant influence on inertia.

H5 RI has a significant influence on inertia.

H6, 7 Inertia mediates the relationships between SI and RI with CUEL.

2.4 Computer self-efficacy (CSE)

The conceptualization of self-efficacy was originally proposed by Bandura in his Social Cognitive Theory (Yokoyama, 2019). Self-efficacy refers to the public's judgments of their capabilities to benefit from a thing (Bandura, 1997). It is an influential factor that can reflect how users' belief in their ability to use technology affects their acceptance of the learning environment (Al-Maroofo et al., 2021). CSE is considered a detailed form of self-efficacy (Mensah & Mi, 2017), and in e-learning literature, it denotes the self-assessment of a person's capability to apply computer skills to complete the specified tasks (Compeau & Higgins, 1995; Chen 2017). The obtained experiences through this approach are constructive and pleasurable. It is usually identified as the ability to use technology without facing any crucial problems (Al-Maroofo et al., 2021). As Bandura (1999) stated, self-efficacy is ingrained in the core belief that one has the power to produce changes by one's actions. To his belief, self-efficacy influences decision-making (Bandura, 1997).

Within the environment of e-learning, self-efficacy is highly connected to users' own beliefs regarding technology (Al-Maroofo et al., 2021). Some believe that using technology is greatly easy and attainable, while others may face problems in learning and using the appropriate way of applying technology (Bailey et al., 2017). As Hayashi et al., (2004), stated the success of an e-learning program in information technology requires users to be equipped with a certain degree of CSE and its effect on information systems. Due to the theory of self-efficacy, CSE was found to meaningfully impact individuals' expectations of the consequences of using computers, their emotional responses, and their actual behavior (Hayashi et al., 2004). Thus,

CSE represents a central individual attribute, which moderates social attributes on one's decision to activity in the online environment, including e-learning (Compeau & Higgins, 1995; Hayashi et al., 2004; Peng et al., 2006; Chien, 2012; Liu & Hung, 2016). Thus, we hypothesize that:

H8, 9, 10 CSE moderates the relationships between SI, inertia, and RI with CUEL.

3 Method

3.1 Data Collection

The research hypotheses were tested utilizing a sample of students in three public universities who have been involved in e-learning activities in the capital of Iran, Tehran. This research was conducted through a relational survey model. As long as the interaction between multiple variables is important in social science, the relational survey model was used (Özbey & Kayri, 2022). As mentioned in previous studies (Del Rincon et al., 2003; Lew et al., 2019; Sánchez & Karaksha, 2022), survey-based method are frequently used in the field of education perhaps owing to the evident ease and openness of this method. The participants of this study consist of university students receiving education through the e-learning systems. Using a simple random sampling method, we distributed 550 questionnaires among students from different faculties in these universities (the University of Tehran, Allameh Tabataba'i University, and Alzahra University). These universities are among the universities that had the virtual class before COVID-19 and held online courses before COVID-19 in 2018.

The data collection process last for three months from May to July in 2020. The initial questionnaire was pilot tested for its validity and reliability, ease, appropriateness, and grammatical and presentation errors and subsequently refined using the responses from the pilot study. Answering time for the survey was about 15 min. The answers were returned to the academics directly after completion without the use of intermediaries. In collecting the data, an online and face to face questionnaire was distributed to collect the responses from respondents. Finally, 384 usable data were selected following the formula set up by Krejcie and Morgan (1970) with 5% margin of error (response rate=0.69%). Different methods have been used to govern the sample size. As Hair et al., (2017) recommends that the common used methods in PLS-SEM is the '10-time rules', indicating that sample size should be equal to the larger values between the construct with the biggest number of formative indicator and the endogenous construct with the largest number of independent exogenous construct predicting it the endogenous construct. Considering the sample size consideration, 384 users of the survey are a sufficient number of sample size. According to Tables 1 and 52.6% of the students were male, and 47.4% were female. The majority of students, about 46.6%, are 26–30 years old. 29.8% are aged between 18 and 25, 16.9% are aged between 31 and 35, and 6.7 are older than 36. In terms of education, 11.5% of students were undergraduate, and 88.5% were postgraduate. Consent was

Table 1 Sample demographics

Attributes	Categories	Frequency	Percent
Gender	Female	202	52.6
	Male	182	47.4
Age	18–25	114	29.8
	26–30	179	46.6
	31–35	65	16.9
	36–40	12	2.9
	41–45	7	1.9
	46+	7	1.9
Education	Undergraduate	44	11.5
	Postgraduate	340	88.5

Notes: N=384

obtained from all participants included in the study. All respondents were given the right to refuse to participate and to refuse to answer any question they deemed to be too sensitive or that they felt uncomfortable about. All participation in the survey was anonymous and voluntary. Also, The research ethics committee at a university approved the survey; the scholars certified that there would be no ethical objections to the study.

3.2 Measurement

We use validated measures from previous studies to test the model. Questionnaires were distributed among students according to a 7-point Likert-type scale from 1 (strongly disagree) to 7 (strongly agree). It adopted three items to measure CUEL (Ahmad & Khalid, 2017; Bhattacharjee & Hikmet, 2007; Liao et al., 2007). The RI is measured by six items (Prentice et al., 1994; Ren et al., 2012; Sassenberg, 2002). In addition, SI has been measured by seven items (Prentice et al., 1994; Ren et al., 2012; Sassenberg, 2002). Four items were adapted (Shih, 2008) to measure CSE, and inertia was measured using three items (Polites & Karahanna, 2012) (see Table 2 for full list of measures).

3.3 Data analysis

The partial least square (PLS) is applied for model validation (Ringle et al., 2012). Furthermore, PLS has at least a demand on the measurement scale that does not require a unique distribution for measured variables (Chin, 1998). So to analyze the data, the SmartPLS3 software was utilized (Ringle et al., 2015). So to test the measurement model, we examine (1) Cronbach alpha (Ca), Composite Reliability (CR), and Average Variance Extracted (AVE), and (2) Discriminant validity. (3) The research evaluated the structural model by examining collinearity [variance inflation factor (VIF)], coefficient of determination (R^2), predictive relevance (Q^2), the standardized root mean square residual (SRMR), and goodness of fit (GoF).

3.4 Common method variance (CMV)

As recommended by Kock & Lynn (2012), a full collinearity test was performed to assure CMV. All VIF values in our research are less than 3.3, therefore, CMV does

Table 2 Descriptive analysis, factor loading, and reliability

Variables	Factor loading	VIF	AVE	CR	CA	rho_A
Continuance Use of E-learning (CUEL)			0.795	0.921	0.872	0.891
Source: (Ahmad & Khalid, 2017; Bhattacharjee & Hikmet, 2007; Liao et al., 2007).						
CU1: I intend to use the e-learning system in the subsequent semesters.	0.904	2.310				
CU2: I predict that I will continue to use e-learning regularly.	0.871	2.351				
CU3: I will use e-learning soon.	0.899	2.304				
Relational Identity (RI)			0.616	0.889	0.847	0.871
Source: (Prentice et al., 1994; Ren et al., 2012; Sassenberg, 2002)						
RI1: I frequently communicate with some members of this community.	0.744	2.095				
RI2: I feel some members of this community are critical to me.	0.850	2.603				
RI3: Some members of this community are well acquainted personally with me.	Removed – Due to Low factor loading					
RI4: I felt close to some members of this community.	0.798	3.147				
RI5: Some members of this community have influenced my thoughts and behaviors (dropped).	0.782	3.157				
RI6: I have many friends that come from this community (dropped).	0.746	1.429				
Social Identity (SI)			0.610	0.862	0.786	0.787
Source: (Prentice et al., 1994; Ren et al., 2012; Sassenberg, 2002)						
SI1: I feel connected to specific groups in this community (dropped).	0.741	1.659				
SI2: I often acknowledge that I am a member of specific groups in this community (dropped).	0.836	2.282				
SI3: I feel I am a typical member of specific groups in this community.	0.807	1.811				
SI4: I identify with specific groups in this community.	Removed – Due to Low factor loading					
SI5: I feel it is essential to belong to specific groups in this community.	0.736	1.328				
SI6: I am attached too much to specific groups in this community.	Removed – Due to Low factor loading					
Computer Self-efficacy (CSE)			0.619	0.830	0.701	0.709
Source: (Shih, 2008)						
CSE1: I could complete the job using a new computer-based system if no one was around to tell me what to do as I go.	0.757	1.265				

Table 2 (continued)

Variables	Factor loading	VIF	AVE	CR	CA	rho_A
CSE2: I could complete the job using a new computer-based system with only the software manuals for reference.	Removed – Due to Low factor loading					
CSE3: I could complete the job using a new computer-based system if I had much time to complete the job for which the software was provided.	0.774	1.377				
CSE4: I could complete the job using a new computer-based system if I had just the built-in help facility for assistance.	0.828	1.518				
Inertia			0.854	0.922	0.830	0.830
Source: (Polites & Karahanna, 2012)						
Inertia1: I [will] continue using this community even though I know it is not the best way of doing things.	Removed – Due to Low factor loading					
Inertia2: I [will] continue using this community even though I know it is not the most efficient way	0.924	2.011				
Inertia3: I [will] continue using this community even though I know it is not the most effective way to do things.	0.925	2.011				

Notes: N=384, CU=Continuance use, RI=Relational Identity, SI=Social Identity, CSE=Computer Self-efficacy,

not strongly influence the measurement model. Next, Harman's one-factor test was adopted to evaluate if CMV was present and severe to influence our results. This test determines that CMV is a severe problem if one un-rotated factor appears from data analysis (Scott & Bruce, 1994). Moreover, no single factor in this research was considered for higher than 50% of the variance (Podsakoff et al., 2003). Harman's single-factor test reveals that the single factor explained 38.4% of the variance. Consequently, the paths and outcomes of current research are not critically influenced by CMV.

4 Results

4.1 Measurement model

Two methods have been applied to evaluate reliability: *Ca* and *CR*. Both approaches show the internal validity of the scale elements that measured a unique factor (Fornell & Larcker, 1981). The significance of the validity of measurement scales was confirmed, with values of 0.872 for CUEL, 0.701 for CSE, 0.847 for RI, 0.786 for SI, and 0.830 for Inertia. As Hair et al., (2011) have pointed out, the actual *CR* value equals more significant than 0.7. Fit *CR* or internal consistency reliability measured in the current study changed between 0.830 and 0.922. Moreover, the *AVE* was employed to evaluate the convergent validity of the latent variables. According to Fornell & Larcker (1981), in this research, the measures of *AVEs* are over 0.50. Items

Table 3 Mean, standard deviation (SD), and discriminant validity

	Mean	SD	CUEL	RI	SI	CSE	Inertia
CUEL	5.57	1.27	0.891				
RI	4.51	1.54	0.399	0.785			
SI	4.24	1.58	0.297	0.813	0.781		
CSE	5.19	1.43	0.443	0.405	0.340	0.787	
Inertia	4.71	1.42	0.263	0.304	0.365	0.218	0.924

Notes: N=384, CUEL=Continuance use of E-learning, RI=Relational Identity, SI=Social Identity, CSE=Computer Self-efficacy,

with a load less than 0.6 should be eliminated (Hulland, 1999). All items have factor loadings over 0.6 except CSE2, RI3, SI4, SI6, and Inertia1, which are less than 0.6 and were removed (Table 2). The discriminant validity sequences are displayed in Table 3, VIF was applied to test the multicollinearity of the variables. Based on Hair et al., (2011), values below five are considered suitable for this criterion, and values close to 1 also show the acceptable limit for multi-collinearity. Our results confirm that all assessed VIFs for the variables were less than 3.157.

4.2 Assessment of Structural Model

Based on previous research, the predictive power of the model is measured with R^2 (Sarstedt et al., 2014). The three values of 0.75, 0.5, and 0.25 are significant, moderate, and weak values, respectively (Henseler et al., 2009). According to the results, the suggested model (CSE, RI, SI, and inertia) can reveal 31.4% of CUEL variance with $R^2=0.314$. Values of 0.02, 0.15, and 0.35 were received for small, medium, and considerable predictive relevance, respectively (Henseler et al., 2009). Therefore, the predictive relevance of CUEL in the research has been assessed at 0.230. Thus, it can confirm that the suggested framework has a robust predictive relevance ($Q^2_{\text{medium}}=0.230$). Finally, this research estimates the standardized root mean square residual (SRMR) for the model. The rule of thumb is that if the value of SRMR is less than 0.1, this fact shows a good fit (Hu & Bentler, 1999). In this research, the model reaches an SRMR of 0.08, thus setting a confirmatory factor analysis and ordinarily indicating a good fit.

Based on Cohen (1977) and Wetzels et al., (2009), the minimum effect size, called goodness of fit (*GoF*), is 0.10, 0.25, and 0.30, respectively, for small, medium, and significant effects on endogenous variables, provided that minimum *AVE* is higher than 0.50 (Fornell & Larcker, 1981). The estimated result revealed that *GoF* is 0.395, with a minimum *AVE* of 0.610. Therefore, the effect size is large (>0.30), and all the preconditions are met (Cohen, 1977; Tenenhaus et al., 2005).

4.3 Hypotheses testing

4.3.1 Direct Effects

According to Table 4, the results exhibit (H1) that SI had a meaningful influence on CUEL ($\beta = -0.147$, $t=2.098$, $p=0.036$). The influence of RI on CUEL (H2) were also significant ($\beta=0.280$, $t=3.669$, $p=0.000$). The relationship between inertia and

Table 4 Testing hypotheses with direct effects

Hypothesis	β	Standard Deviation (STDEV)	T (O/STDEV)	P	De- ci- sion
H1: Social Identity → CUEL	-0.147	0.070	2.098	0.036	Sup- ported
H2: Relational Identity → CUEL	0.280	0.076	3.669	0.000	Sup- ported
H3: Inertia → CUEL	0.172	0.052	3.323	0.001	Sup- ported
H4: Social Identity → Inertia	0.347	0.094	3.701	0.000	Sup- ported
H5: Relational Identity → Inertia	0.023	0.092	0.248	0.804	Not sup- ported

Table 5 Testing Mediating effect

Hypothesis	β	Standard Deviation (STDEV)	T Statistics (O/STDEV)	P Values	De- ci- sion
H6: Social identity → Inertia → CUEL	0.060	0.025	2.342	0.019	Sup- ported
H7: Relational identity → Inertia → CUEL	0.004	0.017	0.235	0.814	Not Sup- ported

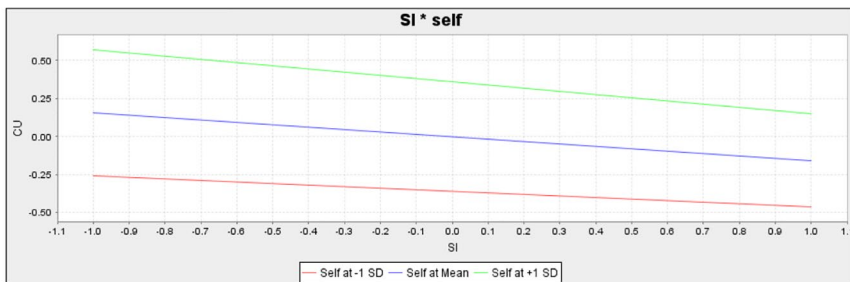
CUEL (H3) was supported ($\beta=0.172$, $t=3.323$, $p=0.001$). Likewise, the direct influence of SI on inertia (H4) was significant ($\beta=0.347$, $t=3.701$, $p=0.000$). However, estimates revealed that H5 (RI direct impact on inertia) is insignificant ($\beta=0.023$, $t=0.248$, $p=0.804$). Therefore, these present findings confirm all the hypotheses relating to direct effects, and only H5 is not supported.

4.3.2 Testing Mediating Effects

We followed the stages described by Hair et al., (2017) in this study. Inertia as a mediator (H6) had a significant indirect influence on the relationship between SI and CUEL ($\beta=0.060$, $t=2.342$, $p=0.019$). In addition, the findings show that inertia (H7) does not have a significant indirect influence on RI and CUEL ($\beta=0.004$, $t=0.235$, $p=0.814$). Table 5 represents the results of mediation effects.

Table 6 Testing moderating effect

Hypothesis	β	Standard Deviation (STDEV)	T Statistics (O/STDEV)	P Values	Decision
H8: Social identity * CSE $\rightarrow$ CUEL	-0.064	0.095	0.679	0.498	Not Supported
H9: Inertia* CSE $\rightarrow$ CUEL	-0.237	0.056	4.275	0.000	Supported
H10: Relational identity* CSE $\rightarrow$ CUEL	0.202	0.089	2.273	0.023	Supported

**Fig. 2** Moderating effects of computer self-efficacy on the link between social identity and continuance use

4.3.3 Testing moderating Effects

The test of the hypotheses of the moderating effects is presented in Table 6. In H8, the moderating influence of CSE on the influence of SI on CUEL is investigated. The result revealed that there is no significant moderating influence of CSE on the hypothesized influence ($\beta = -0.064$, $t = 0.679$, $p = 0.498$). Therefore, H8 is not supported. The result regarding H8 is shown in Fig. 2. Also, in hypothesis 9, CSE tests the influence of inertia on CUEL. The CSE interaction showed an important influence ($\beta = -0.237$, $t = 4.275$, $p = 0.000$). The result regarding H9 is shown in Fig. 3. When CSE was high, inertia was positively related to CUEL, whereas when CSE was low, inertia reduced CUEL. Accordingly, H9 is also supported. Finally, Fig. 4 presents the moderating impact of CSE on the link between RI and CUEL. When CSE was high, RI positively affected CUEL, whereas when CSE was low, RI reduced CUEL. The interaction effect of CSE demonstrated significant influence ($\beta = 0.202$, $t = 2.273$, $p = 0.023$). Accordingly, H10 is also confirmed.

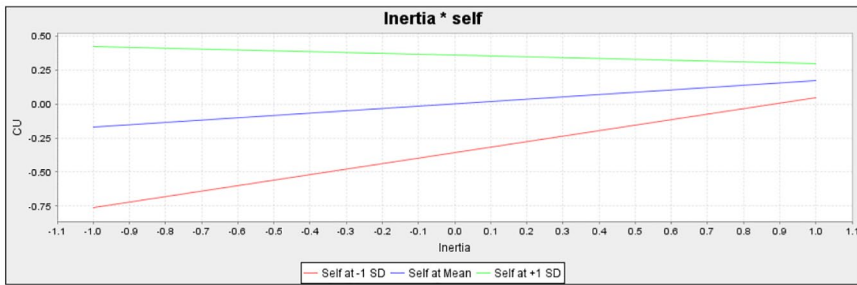


Fig. 3 Moderating effects of computer self-efficacy on the link between inertia and continuance use

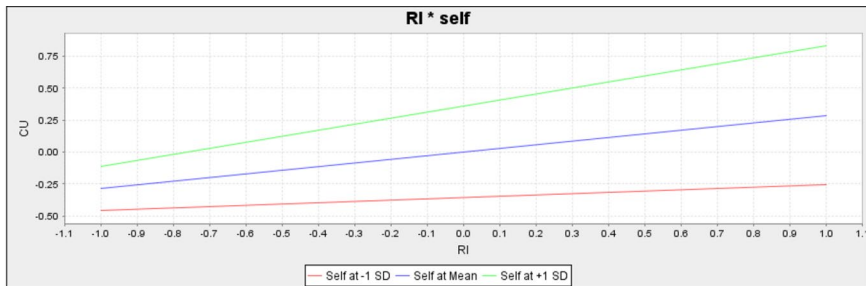


Fig. 4 Moderating effects of computer self-efficacy on the link between relational identity and continuance use

5 Discussion

The shift to e-learning was a great challenge to most universities, albeit some universities have already been involved in programs before the beginning of the COVID-19 pandemic. However, during the pandemic, all universities were required to implement e-learning (Yaseen & Salah, 2021). This research reveals important insights for CUEL by emphasizing the mediating role of inertia and the moderating role of CSE. Our results showed that RI and SI directly influence CUEL. Both identities positively influence CUEL (H1 and H2). These results are confirmed by Pan et al. (2017) and Tha et al. (2009). For instance, Pan et al. (2017) revealed that both RI and SI identities have similar effects on user behavior in social media usage. Turk et al. (2022) and Wang (2022) reported that social presence affects users' continuance intention toward online learning platforms. Tha et al. (2009) showed that social ties positively and significantly affect CUEL. Also, Kaye et al. (2017), Jiang et al. (2016), and Mingfang & Qi (2018) confirmed positive relationships between SI and activity in an online environment. RI is associated with a narrower focus on relationship maintenance with individual members; people can significantly impact each other. Thus, enthusiastic people may encourage affected people to CUEL. In our study, the influence of inertia on CUEL (H3) is positive. This result is supported by Wang et al. (2019b), Amoroso et al. (2017), Shi et al. (2018), and Polites & Karahanna (2012),

who found that inertia happens due to the imposition of initial costs in the adoption of new technologies. Contrary to the early days and months of the COVID-19 pandemic, today, after solving numerous hardware and software challenges in higher education and the relative improvement of teachers' and students' insights, suitable e-learning platforms have been provided. Therefore, considering students' satisfaction and the relative reduction of costs compared to traditional training (in general impression) (Meinert et al., 2021), through the use of e-learning, it is necessary to improve the facilities and maintain the facilities attractiveness.

In this study, we found the mediation effects of inertia. In addition to being directly influenced by SI (H4), inertia mediates between this variable and CUEL (H6). The studies results of Polites & Karahanna (2012), Park et al. (2017), Amoroso et al. (2017) and Wang et al. (2019b) support this result. The reason might be found in the evidence that inertia or variety depends on time and the self-individual (Bawa, 1990). In other words, the individual prefers inertia or variety according to time situation and his/her mood. Prior research hints that inertia is an attitude to preserve the status quo and hence prevents the changing behaviors of consumers (Lee & Neale, 2012; Lin & Huang, 2014). Therefore, positive inertia refers to continuing to adhere to the status quo, such as using e-learning. Therefore, CUEL in critical situations such as the COVID-19 pandemic is the most effective method, in which inertia can play an essential role as a mediator in CUEL. Contrary to hypotheses 4 and 6, hypotheses 5 and 7 are not supported. Because there is no direct relationship between RI and inertia (H5), the mediating role of inertia (H7) is not significant. As mentioned earlier, RI is associated with a narrow focus on relationship maintenance with individual members. Hence, some may be encouraged to variety and some to inertia. Therefore, this issue can be one of the reasons for rejecting hypotheses 5 and 7.

Third, results revealed that CSE positively moderates the impacts of inertia and RI on CUEL (H9) (H10), but it does not change the impact of SI on CUEL (H8). Al-Marouf et al. (2021) showed that teachers' and students' perceived technology self-efficacy is one of the main factors affecting the continuance use of technology. Kurdi et al. (2020), Salloum et al. (2019) and Sabah (2020) reported that CSE indirectly has positive effect on intention to use e-learning. Wang et al. (2019a) showed that CSE positively related to continuance to use e-learning application. In general, the research literature emphasizes the positive role of CSE in CUEL (Hsia et al., 2014). According to the results, when CSE was high, inertia increased CUEL. Contrary to the results of this study, it may have been thought that the more CSE a person has, the more active (Vs. inertia) a person is. Nevertheless, the result of this study can be discussed from another angle. According to Bailey et al. (2017), when a person has high levels of CSE, it means that their ability to use the computer correctly and adequately is high. Therefore, it can be said that due to the students' appropriate skills and understanding of the use of computers, due to the COVID-19 pandemic and their correct understanding of this crisis as well as existing platforms, they CUEL in an inertia state (even though e-learning may not be as effective as face-to-face training). According to the results, when CSE was high, RI increased CUEL. Therefore, it can be concluded that the more members in a group are linked to each other, the more CSE accelerates CUEL.

5.1 Theoretical implications

This study has several theoretical implications for research on CUEL. First, the COVID-19 pandemic necessitated the use of e-learning, which had not been so familiar and essential before. Given the e-learning contexts built into emergency management, the post-corona era seems appropriate to expand this learning approach. As a result, it is vital to investigate how to promote the method even after this pandemic (Mo et al., 2021). Second, in this research, we also extend the validity of measures of continuous use from organizational and marketing contexts to e-learning systems along with other variables such as SI, RI, inertia, and computer self-efficacy (Ahuja & Thatcher, 2005; De Guinea & Markus, 2009). Third, this study effectively expands the perception of the relationship between SI-RI and the continuance use of information systems in the post-acceptance phase. Also, the effects of SI and RI on behavior after initial acceptance of e-learning are identified. Therefore, by recognizing the minor impact of the individual level of identity in the later stages of acceptance in the field of e-learning, we contribute to information system research. Fourth, inertia is one of the critical variables of this study. Despite widespread interest in CUEL by academics and professionals, few studies examine students' resilience and inertia. Therefore, the present study bridges this fundamental gap by providing insights into this underdeveloped part of the literature on the factors that influence CUEL of student and emphasizes the potential for future research. So that inertia strengthens CUEL which in the COVID-19 pandemic is a privilege. In some cases, people continue to take the existing action even in the face of superior action if they are aware of the inefficiency of the existing action (Samuelson & Zeckhauser, 1988). Although inertia has been studied in the information system literature (Kim & Kang, 2016; Wang et al., 2019b), it has been very little explicitly studied in the e-learning context, especially along with the variables we have studied, which increases our understanding of the impact of student inactivity on CUEL. As a result, the mediating role of inertia in this study is well explained. Fifth, the moderating effects of CSE indicate that when students' self-efficacy in using e-learning is high, the effect of RI and inertia on CUEL is more. Finally, this study provides a solid basis for the development of future research by helping to deepen the knowledge of students' behavior in CUEL and the importance of e-learning to society, especially during and after the COVID-19 pandemic.

5.2 Managerial implications

Our research findings also provide institutions of e-learning infrastructure service providers and educational managers with rich insights into CUEL. The results showed that each of the elements of SI and RI has different effects on CUEL due to how it relates to the mediating variables of inertia and the moderating variable of CSE. Since the RI is associated with a narrower focus on relationship maintenance with individual members, educational platform providers must upgrade e-learning services and use side options to create deeper connections between users so that users are in constant contact with them and can influence each other. One of the surprising results of this study is the effect of inertia on CUEL. This may be due to the desire of

students to use the e-learning system (Shugan, 1980; Bawa, 1990). Thus, in special situations such as the COVID-19 pandemic, the use of this context is very helpful. Therefore, these results are vital for organizers of educational programs and the providers of e-learning to provide an e-learning system with suitable infrastructure for users so that in today's changing and complex world, they do not neglect progress and development, and make good use of the potential of this alternative context. Another significant result of this research is the essential role of students' CSE and its influence on CUEL, which is crucial for the higher education system and the providers of e-learning. Therefore, the organizers of educational programs and the providers of e-learning platforms should understand that CSE can promote CUEL. In general, the organizers of educational programs can provide students with a general computer training program. Also, in particular, the providers of e-learning platforms can provide students with a guideline to use platforms or provide the necessary training at the beginning of the students' work with the desired platform. In addition, e-learning platform developers need to make an easy-to-use and user-friendly e-learning platform their top priority.

6 Conclusion

Our study theorizes CUEL to build a theoretical framework to ascertain how SI and RI affect CUEL through the mediation effects of inertia and moderation effects of CSE. The outcomes of our analysis disclose that RI and SI have significant joint and different effects on CUEL. High CSE suppresses the positive effects of SI on CUEL. On the contrary, it facilitates the effects of inertia and RI on CUEL. In addition, inertia mediates SI about CUEL. Meanwhile, it does not do this work for RI with CUEL. This research demonstrates notable progress in our theoretical comprehension of the effects of SSI on CUEL. Such clarification provides higher education administrators and platform designers with helpful insights to adopt appropriate strategies regarding students' CUEL.

Our research has three specific limitations as well as three related research suggestions for future work. First, our research did not distinguish between students' fields of study. However, theoretical and practical courses can affect the CUEL. Hence, future work could continue our study by focusing on students' educational field. Second, although respondents of this survey were students from the same background and culture who studied in Iranian universities, the validity and reliability of the model will improve if they study at different universities in other countries. Infrastructure was not considered in this study. However, it can influence the results (Keramati et al., 2011). Therefore, this leads to limitations in examining the moderating effect of the infrastructure. Third, our study participants are students. However, future studies could focus on examining CUEL by teachers as one of the main players in the e-learning process (Elumalai et al., 2020). Such examination will help to achieve comprehensiveness in CUEL.

Data availability The datasets generated during and/or analysed during the current study are available from the corresponding author on reasonable request.

Declarations

Conflict of interest The author(s) declare(s) that there is no conflict of interest regarding the publication of this article.

Statement regarding ethical approval The submitted work is original and have not been published elsewhere or submitted to more than one journal for simultaneous consideration.

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