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The role of students' relational identity and autotelic experience for their innovative and continuous use of e-learning

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Abstract

Over the last decades, using e-learning systems as an alternative format of education for traditional classroom has been growing in higher education and due to COVID-19 pandemic, this transition has been unprecedently accelerated. Although there is a large body of research on e-learning, little is known about the extent to which innovative and continuous use of e-learning systems can be influenced by students' social and motivational factors especially their relational identity and autotelic experience. This study collected data from 400 higher education students through a survey to explore the role of students' relational identity and autotelic experiences regarding their innovative and continuous use of e-learning systems while considering the mediating role of students' perception of relatedness. Collected data were analyzed using the structural equation modeling method. The results showed that students' relational identity and autotelic experience significantly influence the innovative and continuous use of e-learning. The results showed that relational identity and autotelic experience positively associate with innovative ($\beta=0.190$, $t=3.544$; $\beta=0.405$, $t=7.973$) and continuous use of e-learning ($\beta=0.188$, $t=3.115$; $\beta=0.344$, $t=7.459$) and relatedness plays a moderating role between relational identity and continuous use ($\beta=0.194$, $t=4.500$, $p=0.000$). Relatedness weakens the relationship between relational identity and innovative use of e-learning. However, it reinforces the relationship between relational identity and the continuous use of e-learning. It was found that relatedness strengthens the relationship between autotelic experience with innovative and continuous use of e-learning. The results of this study provide evidence of how students' social and motivational factors can influence their approaches to the innovative and continuous use of e-learning systems. We discuss these results and provide agenda for future practical and professional work.

Keywords Continuous use · E-learning system · Innovative use · Relatedness · Relational identity

Extended author information available on the last page of the article

1 Introduction

Information and Communication Technologies (ICTs) have had a huge impact on education which resulted in the formation of e-learning systems (Mishra et al., 2020). E-learning is an essential tool to counter the demand for favorably qualified specialists in the modern technological world (Vershitskaya et al., 2020). E-learning is the transfer of information and skills via electronic media such as the Internet, intranets, and extranets in well-designed course content with reputable accreditations (Choudhury & Pattnaik, 2020). Since the outbreak of COVID-19 and due to the urgent transition from face-to-face to online education, educational providers including higher education institutions have been widely using e-learning systems (Drachler et al., 2021). Nowadays, e-learning is the main format to deliver education almost in all educational institutions across the globe (Aboagye et al., 2021) and due to its importance at this time, the number of studies exploring different angles of e-learning systems for delivering effective teaching and learning under COVID-19 situation has been rapidly growing (e.g., Meulenbroeks & Joolingen, 2022; Mishra et al., 2020; Su & Guo, 2021). For example, Su and Guo (2021) did look into students' online learning experiences and found that system quality, course design, peer interaction, and self-discipline have positive impacts on students learning outcomes and satisfaction. Some other studies have focused to address the challenges of e-learning during the COVID-19 pandemic (Aboagye et al., 2021), the role of motivation (Rahman et al., 2021), students' well-being (Meulenbroeks & Joolingen, 2022), teaching methods (Mishra et al., 2020), students' engagement (Heo et al., 2021), learning satisfaction (Simsek et al., 2021), and learning performance (Stevens et al., 2020).

One of the key factors in e-learning that has not been largely investigated is to know the variables that affect students' acceptance and use of e-learning systems (e.g., Aguilera-Hermida, 2020). How students accept and use e-learning is a crucial factor in the success of e-learning (Salloum et al., 2019; Tania et al., 2022a, b). If students do not accept using e-learning systems or if they use such e-learning systems unwillingly, then the effectiveness of e-learning will be under question (Cheng, 2011; Salloum et al., 2019; Tania et al., 2022a, b). Another key step in the success of e-learning is the innovative use of e-learning (Egbodo et al., 2022). The innovative use of e-learning refers to students' engagement in using various features of e-learning or using e-learning in different and new ways (Chu et al., 2021; Li et al., 2013). The innovative use of e-learning plays an important role in the effectiveness of e-learning (Sharma & Mohan, 2022). In addition, it is important to explore what affects students' continuous use of e-learning. Continuous use of e-learning refers to the student's subsequent use of e-learning after the first experience (Bøe et al., 2021). According to the literature related to the continuous use of information systems, continuous use refers to the students' use of the e-learning system repeatedly and continuously (Chiu et al., 2005; Chow & Shi, 2014; Tania et al., 2022a, b). Using e-learning continuously is vital to ensuring effective use and positively impacting students (Alharthi et al., 2018). Numerous studies have demonstrated that continued usage by the user is an indicator of success in e-learning,

and in recent years, research on continued use of e-learning has been examined at a higher level than before (Alharthi et al., 2018; Tania et al., 2022a, b). Studies have shown that there are different factors affecting students' innovative and continuous use of e-learning such as the possibility of knowledge sharing, quality teaching (Salloom et al., 2019), online support and study facilities (Selim, 2007), or information quality, system quality, the usability of the e-learning system, technology self-efficacy, perceived usefulness and ease of use of e-learning, and organizational support (Akbari et al., 2022; Liao & Lu, 2008), and the characteristics of the instructor (Cidral et al., 2018). However, research on the innovative and continuous use of e-learning is limited particularly considering students' social and motivational drivers (Song et al., 2004).

Studies have shown that social and motivational factors such as relational identity and autotelic experience influence individual behavior and action (e.g., Curley & Polites, 2020). Relational identity is present in the Social Identity Theory (SIT) and explains the quality of relationships, and it means creating role relationships of people with other people who focus on themselves in interpersonal relationships (Sluss & Ashforth, 2007). Tajfel (1982, p. 292) states that a person's social identity is one's knowledge and perception of belonging to a certain social group and his/her relationship with group members. Studies have shown that social identity based on value groups includes evaluation elements, emotional and cognitive, and is a behavioral enhancer that promotes identity retention (e.g., Bagozzi & Dholakia, 2006). In this study, we argue that individuals with higher levels of relational identities are more involved in the innovative and continuous use of the e-learning system (Pan et al., 2017).

Flow is a state in which a person becomes fully involved in favorite work and activity, and this activity is so satisfying and enjoyable for the person that wants to repeat it (Finneran & Zhang, 2005). Students who enter this flow gain an autotelic experience from the full engagement of e-learning, which encourages them to continue the use of e-learning (Rovai, 2003). Autotelic experience is a valuable and optimal experience in which a person does an activity for their orientation and is the result of being in flow (Jackson & Marsh, 1996). Therefore, this intrinsic motivation can lead to enjoyment and satisfaction of an activity that encourages innovation (Li et al., 2013). When students enjoy using e-learning and have a good memory of it, it may lead to the innovative use of e-learning.

Examining some of the individual factors that act as a moderator of relational identity and autotelic experience's relationship to using the e-learning system can indicate significant differences between individuals (Pituch & Lee, 2006). In this regard, a few studies have addressed individuals' inherent motivation to use technology and more specifically e-learning systems (Hew & Sharifah, 2017). The Self-Determination Theory (SDT) states that users take action without external motivation (Deci & Ryan, 2012). Based on the SDT, people have three psychological needs: autonomy, competence, and relatedness. To date, little is known about moderating role of relatedness thus, this study identifies relatedness as one of the individual factors that can play a moderator role in relationships between the motivational and social factors with the use of e-learning systems. Therefore, the purpose of this study is to explore how students' relational identities and autotelic

experiences with the moderating role of relatedness influence the innovative and continuous use of e-learning.

2 Theoretical framework and hypotheses development

2.1 Relational identity and innovative use

The SIT states that individuals' sense of personal worth is the group's product through which these individuals are known (Hogg, 2016). Social identities play an essential role in numerous aspects of life, not least in health and well-being. Research demonstrates that these relationships are driven by various social identity processes, including identification with groups, social support obtained from groups, and multiple group memberships (Bentley et al., 2020). Therefore, researchers can understand and predict people's behavioral decisions and operations using their social identities (Sieger et al., 2016). Two different levels of social identity include the collective and the relational level (Zhang et al., 2014). The collective level refers to the social identity derived from observing oneself as a follower of a social or collective network (Tajfel, 1982). Relational identity expresses the individual's emphasis on interpersonal relationships and establishing role relationships with others (Sluss & Ashforth, 2007). For example, a classification in which individuals shape themselves according to their specific role relationships with close relatives (e.g., parents, physician, patient) (Brewer & Gardner, 1996).

Identity theories express how individuals' role and relationships and, consequently, their performance concerning others are affected by individuals' communication networks (Sluss & Ashforth, 2007). The key features of a follower's identification using developed interpersonal relationships with individual members in the e-learning space are displayed through relational identity (Cocking, 2008). Relational identity is a factor that makes members feel self-sacrificing or emotionally committed to their interpersonal relationships and taking actions that greatly enhance their relational identity and ultimately increase their desire to maintain a relational identity (Lin & Lu, 2011).

Therefore, students with a high relational identity may feel belonging to the e-learning system use and try to discover new ways of using this system. Innovative use denotes the use of e-learning in a new way or the use of new features of the e-learning system by students. Innovative use emerges where in the next stage after the initial acceptance of e-learning and acquaintance and gaining experience from it, students may not be satisfied with the current features of this type of training and look for new features (Pan et al., 2017). Understanding the need for this diversity helps students increase their attention and concentrate on the e-learning system. Therefore, we hypothesize:

H1: Relational Identity has a significant influence on the innovative use of e-learning.

2.2 Relational identity and continuous use

Relational identity affects the persistence of behavioral intent and personal preferences (Hogg, 2016). Because in relational identity, time, effort, and feelings are invested in maintaining and developing the relationship; therefore, relational identity is effective in continuous use (Burnham et al., 2003). When a person's dependence on a relationship partner increases, the relationship becomes restrictive (Stanley & Markman, 1992). Now, if these ties are weakened, it will cause both costs and psychological and emotional distress. It can be argued that if students use e-learning less or no longer use it, investments in relationships decrease. Students' reluctance to lose their interpersonal relationships with the professor and other students makes them highly motivated to use familiar features to contact others in this system (Tania et al., 2022a, b).

The continued use of e-learning systems helps students become more familiar with e-learning and its benefits, and finally, this type of e-learning, which may replace part of face-to-face learning, is woven into students' lives (Akbari et al., 2022; Bøe et al., 2021; Liao & Lu, 2008). Therefore, students with higher relational identities are more motivated to continuously use the e-learning system because they understand the continuous use of e-learning to better interact with teachers and other students. Previous research has also confirmed that interpersonal relationships positively correlate with information system behaviors such as continuous use (Lin & Lu, 2011; Xiang & Chae, 2022). As a result, students' relational identity can effectively lead to continuous use. Thus, it was hypothesized:

H2: Relational Identity has a significant influence on the continuous use of e-learning.

2.3 Autotelic experience and innovative use

Flow manifests as a state of apparently effortless concentration wherein one is thoroughly absorbed in what they are doing (Csikszentmihalyi & Graef, 1975) and can occur during a wide range of daily activities, including work, physical activity, technology usage, and interactions with others (Aubé et al., 2014; Lavoie et al., 2022). Flow Theory is characterized by nine elements which include (1) a challenging activity needs crafts, (2) blending action of consciousness, (3) transparent objects, (4) quick feedback, (5) focusing on the duty at hand, (6) a feeling of control, (7) loss of self-consciousness, (8) falsification of time, and (9) autotelic experience (Nah et al., 2011). These dimensions contain challenge-skill balance (feeling competent sufficiently to meet the heightened demands of the situation), action-awareness merging (doing things spontaneously and automatically without having to think), clear goals (having a strong sense of what one wants to do), unambiguous feedback (knowing how well one is doing during the performance itself), concentration on the task at hand (being utterly focused on duty at hand), sense of control (having a feeling of total control over what one is doing), loss of self-consciousness (not worrying what others think of oneself), the transformation of time (having the sense that

time passes in a way that is different from usual), and autotelic experience (feeling the experience to be extremely rewarding) (Martin & Jackson, 2008). Based on this theory, flow experience occurs in steps and does not happen all at once. According to studies, when a person enters a flow, it enhances learning, positive experience, a transformation of attitude, creativity, and innovative ways (Agarwal & Karahanna, 2000; Finneran & Zhang, 2005).

The heart of the optimal experience or flow is the autotelic experience (Csikszentmihalyi, 1988). One of the main features of the autotelic experience is that it occurs during an interaction (Asakawa, 2004). In fact, during this interaction, consciousness shifts and finds an invisible pull toward the desire to maintain and perpetuate this enjoyable moment (Leyton-Román et al., 2020). In this case, the attention exceeds the usual level and increases awareness and sensory attention. It means a constant motivation to stay in the interaction for the sake of the interaction itself. So receptive interaction is a fundamental principle of the autotelic experience.

If the e-learning system passes the initial acceptance stage, then users will be able to participate in innovative use through their relative familiarity with the e-learning system which was not possible at the early adoption phase (Ahuja & Thatcher, 2005). Innovative use of e-learning systems means using various and novel features or using them in a distinct approach (Saga & Zmud, 1994). In innovative use, students are generally trying to increase their insight into the e-learning system's potential, including learning more. Students who interact with e-learning and gain optimal and enjoyable experiences have a positive attitude towards the web-based environment. This autotelic experience allows them to be creative and excited and explore new ways to use e-learning, and take advantage of new e-learning features. Therefore, we hypothesize:

H3: Autotelic Experience has a significant influence on the innovative use of e-learning.

2.4 Autotelic experience and continuous use

Studies have shown that e-learning's acceptance and use can be affected by Flow theory (Esteban-Millat et al., 2018). Flow is a holistic feeling that a person feels when engaging in an all-encompassing activity. Flow theory can be considered a fundamental theory for understanding the continuity of intent to use technology (Agarwal & Karahanna, 2000; Bölen et al., 2021). Previous research has shown that flow is positively associated with continuous use of the web, constant play behavior, perceived ease of use, and perceived satisfaction (Dhir et al., 2020). An autotelic experience is one of the nine dimensions of flow that was defined as the result of flow and activity that one does for oneself without expecting remuneration or advantage (Csikszentmihalyi, 1988). An autotelic experience is interpreted as a worthy inherent experience. The main element of the autotelic experience is interaction. Shifting from the usual attention to autotelic attention is conducted by forming the autotelic loop and continuing the pleasure. Thus, an autotelic experience is a dynamic and relational phenomenon that connects the individual to interact

in an inherently valuable activity (Schmid, 2009). Research on games suggests that when game-type features are done, they make learning more pleasant by challenging a person's curiosity, growing interest in theoretical knowledge, and gaining more attention (Tse et al., 2019). Being pleasant, enjoying, happy, and cheerful are all considered internal motivators for the constant acceptance of technology (Venkatesh & Brown, 2001). In continuous use, students' cognition is improved according to routine and repetitive methods of using e-learning. Students with autotelic experience enjoy engaging in e-learning because of their involvement in it, regardless of the benefits it may bring them, and want to continue this use of e-learning. Consequently, it was hypothesized:

H4: Autotelic Experience has a significant influence on the continuous use of e-learning.

2.5 The moderating role of relatedness

The SDT derived from Cognitive Evaluation Theory (Deci & Ryan, 2000), examines one's action based on voluntary motivation, intrinsic value, and pleasure rather than action based on external reward or punishment (Deci & Ryan, 2008). Intrinsic motivation, along with an excellent level of independence and autonomy, is determined through behaviors arising from an inherent interest or pleasure of duty (Nie et al., 2015). Many studies acknowledge that inherent motivation compared to external motivation guides to better durability, well-being, and performance in diverse fields (e.g., Black & Deci, 2000). The SDT states that humans' intrinsic motivation is determined by the three psychological needs of autonomy, competence, and relatedness. According to research, people's persistence in some activities shows that these three needs are well met in those activities (Sheldon & Elliot, 1999). One of these psychological needs that are considered as a moderator variable in this paper is the need for relatedness. The need for relatedness discusses the need to feel an intimate relationship and support from influential people such as parents, teachers, and classmates (Deci & Ryan, 2000). Therefore, when people realize close relationships with their group members, they pursue the group's goals more and become more motivated (Deci & Ryan, 2008).

In relational identity, individuals introduce themselves based on interpersonal relationships with others with values and beliefs. These individuals express their individuality through a desire to fulfill role expectations in terms of interpersonal relationships (Zhang et al., 2014). In connection with e-learning, people communicate with other members through the use of system characteristics. Using system features that vary from one person to another facilitates identity confirmation for people. Two different practical behaviors after adopting the e-learning system include continuous and innovative use by group members which is also different from the intention to use (Egbodo et al., 2022; Tania et al., 2022a, b). Continuous use indicates a person's repeated intentional or unintentional actions to use an information system. Innovative use applies to the individual's intentional actions to check the various features of an information system or technology and use it differently

(Pan et al., 2017). As a result, self-determination is an essential factor that can motivate students to involve in e-learning (Joo et al., 2018). With this argument, students with high relatedness levels may display their relational identity through innovative use and continuous use of e-learning after the acceptance phase.

Autotelic experience is another variable that is considered as an activity that people do because of the optimal experience and the pleasure they get from it and not because of the rewards and benefits that they may receive, and this is precisely related to intrinsic motivation (Csikszentmihalyi, 1988). As mentioned earlier, the autotelic experience predicts continuous use (Venkatesh & Brown, 2001), and innovative use (Ahuja & Thatcher, 2005). The need for relatedness among students using e-learning reflects a desire for close communication and support from teachers and other classmates. There is an argument that meeting the need for relatedness and support in a social context influences the level of motivation (Deci & Ryan, 2008). Relatedness may positively moderate the relationships between autotelic experience, and innovative and continuous use. If students can satisfy the need for relatedness while using e-learning, they are more likely to gain autotelic experience from this type of training and become more motivated, as a result of which students tend to be innovative and continuous use from use of e-learning. Thus, the next hypotheses are presented:

H5: Relatedness has a moderating influence between relational identity with (H5a) innovative use and (H5b) continuous use and between autotelic experience with (H5c) innovative use and (H5d) continuous use of e-learning.

2.6 Conceptual model

Based on the theoretical framework and hypotheses explained above, the conceptual model of the study is presented in Fig. 1.

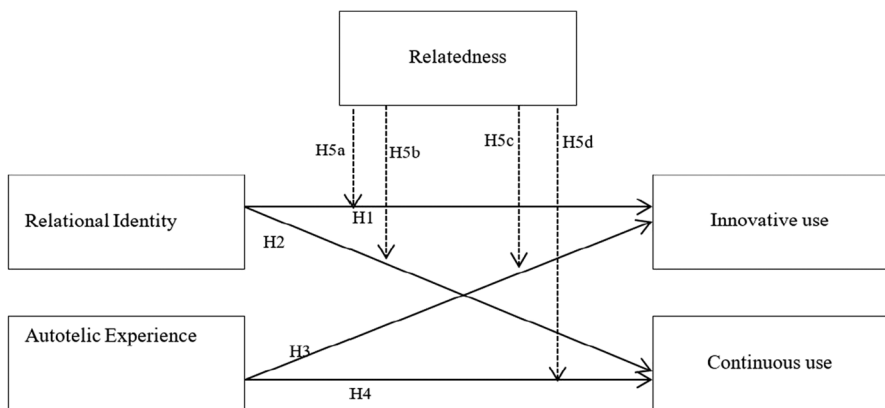


Fig. 1 Conceptual model of the study

3 Method

3.1 Participants

In this study, 400 students participated from universities in Tehran County who have used e-learning during their studies in the academic year 2020–2021. However, only 384 students filled out the surveys. Data was collected with face to face survey and also three follow-up stage was conducted to ensure collect the appropriate sample, therefore the missing data was rare and the returning rate of the index was about 96%. The answering time for the questionnaire was about 20–25 min. The sample consists of students from *the University of Tehran, Allameh Tabataba'i University, and Alzahra University*; these were selected through a multistage stratified random sampling process. Among participants, almost 53% of students declared their gender as female ($N=204$) and about 47% declared as male ($N=180$). In addition, 28% of participants were undergraduate students ($N=108$) and 72% of participants were graduate students ($N=276$). To comply with ethical considerations, all students were informed that their data will be treated carefully and anonymously and no one will be able to link any data to any individual participant. Students were invited to quit participation in the study if they are not willing to participate; however, none declined.

3.2 Measurements

The questionnaire has consisted of two parts. The second part included demographic variables (i.e. age, ...) and the second part covered the variables emphasized in the research model, including relational identity, autotelic experience, innovative use, continue use, and relatedness. This section consisted of 25 items. The initial questionnaire was pilot tested on 30 students. Questionnaire reliability was tested using Cronbach alpha (Table 3). All items of these scales were designed based on a seven-point Likert scale including strongly disagree (1), disagree (2), rather disagree (3), neither disagree nor agree (4), rather agree (5), agree (6), and strongly agree (7), (See Appendix, Table 3).

3.2.1 Students' relational identity

Students' relational identity in e-learning was measured by using a six-item scale (Ren et al., 2012). The items of the relational identity scale include statements such as "I frequently communicate with some peers in e-learning", "I feel some peers of e-learning are very important to me" or "I felt close to some peers in e-learning". The higher score on this scale represents the strength of students' relational identity. The Cronbach's alpha results found for this scale showed significant reliability ($\alpha=0.670$).

3.2.2 Students' autotelic experience

Students' autotelic experience in e-learning was measured by using an adapted version of a scale developed by Jackson and Marsh (1996). This scale consists of three items including "I really enjoying the experience of e-learning", "My abilities match the challenges in e-learning", and "Things just seem to happen automatically in e-learning. A higher score on this scale indicates a higher autotelic experience of students. The Cronbach's alpha results found for this scale showed high reliability ($\alpha=0.880$).

3.2.3 Students' innovative use of e-learning

Students' innovative use of e-learning was measured by using a scale developed by Huang et al. (2018). This scale includes four items "I use e-learning innovatively to improve my performance", "I use e-learning innovatively if I am given an opportunity to use it", "I use e-learning innovatively to improve my learning process", and "I use e-learning innovatively to better manage my activities". A higher score on this scale indicates a higher innovative use of e-learning. The Cronbach's alpha results for this scale showed high reliability ($\alpha=0.798$).

3.2.4 Students' continuous use of e-learning

Students' continuous use of e-learning was measured through a three items scale (Liao et al., 2007). The items are "I intend to use the e-learning system in the next semesters", "I predict that I will continue to use e-learning regularly", and "I will use e-learning soon". A higher score on this scale represents the higher continuous use of e-learning. The Cronbach's alpha results for this scale showed high reliability ($\alpha=0.872$).

3.2.5 Students' relatedness in e-learning

Students' relatedness in e-learning was measured by using an adapted version of a nine items scale (Deci & Ryan, 2000). Some of the items of this scale are "I get along with people I come into contact with in e-learning", "I consider the people I regularly interact with in e-learning to be my friends", and "People are generally pretty friendly with me in e-learning". A higher score on this scale represents a higher relatedness in e-learning. The Cronbach's alpha results for this scale showed high reliability ($\alpha=0.893$).

3.3 Analysis of data

A panel of experts confirmed the validity of the questionnaire. The internal consistency of the scales was measured by using Composite Reliabilities (CR), Average Variance Extracted (AVE), and Cronbach's alpha coefficient ($C\alpha$) (see appendix).

To measure potential common method bias, VIF and Harman's single factor test was used. For the validation of the measurement model and testing the hypothetical relations, a structural equation modeling method using Partial Least Squares (PLS) was conducted.

3.4 Common Method Bias (CMB)

Richardson et al., (2009, p. 763) define CMV as "systematic error variance shared among variables measured with and introduced as a function of the same method and source." The reason for focusing attention on this subject is that the researcher's findings are at risk since the findings regarding the model's relationships may be erroneous (i.e., the error is too large for the relationships to be valid). We used two methods to measure potential CMB. The occurrence of a VIF higher than 3.3 is projected as an indication of pathological collinearity, and as an indication that CMB may contaminate a model. Thus, if all VIFs resulting from a full collinearity test are equal to or lower than 3.3, the model can be reflected free of CMB (Kock, 2015). The finding displayed that the VIF for variables was equal to or lower than 3.3. Hence, CMB can be ruled out and our findings were not influenced by this bias. Also, Harman's single factor test was used. This method (Harman, 1960) utilizes exploratory factor analysis where all variables are loaded onto a single factor and restrained so that there is no rotation (Podsakoff et al., 2003). This new factor is commonly not in the researcher's model; it is introduced solely for this analysis and discarded. Common method bias may be present if the newly introduced common latent factor explains more than 50% of the variance. Harman's single factor test indicated that the single factor explained under 50% of the total variance (Podsakoff et al., 2003) (Table 1).

4 Results

4.1 Structural model

The structural model, which determines the path coefficients (β) and significance level attained from the Bootstrap test are presented (see Fig. 2, Table 2). Structural

Table 1 Mean, SD, and construct correlations

Variables	Mean	SD	IU	CU	AE	RI	REL
IU	5.299	1.051	0.794				
CU	5.579	1.138	0.573	0.892			
AE	4.900	1.129	0.538	0.463	0.846		
RI	4.518	1.231	0.457	0.395	0.463	0.789	
REL	5.153	1.005	0.365	0.264	0.243	0.497	0.733

N = 384, *N* = 384, IU = Innovative use, CU = Continuous use, AE = Autotelic Experience, RI = Relational Identity, REL = Relatedness, *P* < 0.01 level

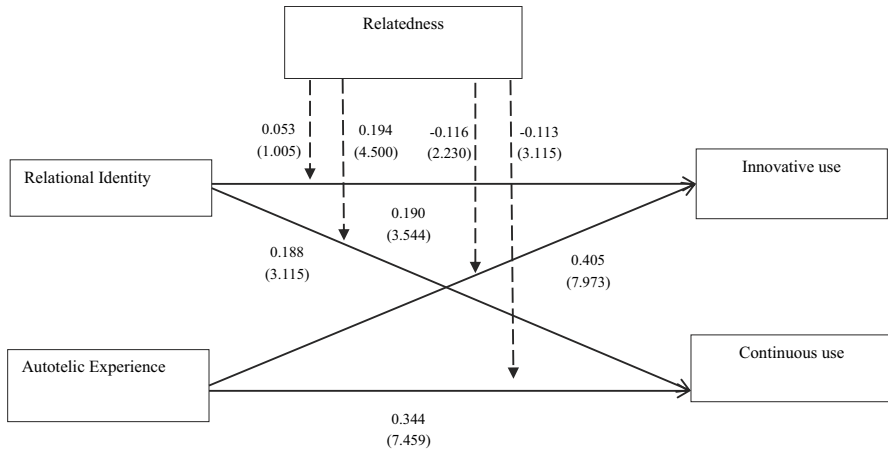


Fig. 2 Path model display

Table 2 Hypothesis Testing Results (Path Coefficients)

Hypothesis	β	<i>T</i> -value	<i>P</i> -value	Result
H1: RI \rightarrow IU	0.190	3.544	0.000	Supported
H2: RI \rightarrow CU	0.188	3.115	0.002	Supported
H3: AE \rightarrow IU	0.405	7.973	0.000	Supported
H4: AE \rightarrow CU	0.344	7.459	0.000	Supported
Moderation role of Relatedness				
H5 _a : RI * REL \rightarrow IU	0.053	1.005	0.315	Not supported
H5 _b : RI * REL2 \rightarrow CU	0.194	4.500	0.000	Supported
H5 _c : AE * REL \rightarrow IU	-0.116	2.230	0.026	Supported
H5 _d : AE * REL2 \rightarrow CU	-0.113	3.115	0.002	Supported
R ² for IU				0.381
R ² for CU				0.294

$N=384$, $N=384$, IU=Innovative use, CU=Continuous use, RI=Relational Identity, AE=Autotelic Experience, REL=Relatedness, $+p < 0.1$; $*p < 0.05$; $**p < 0.01$; $***p < 0.001$

path coefficients and R^2 values assess the structural model. Ultimately, the estimates' stability is analyzed by using the *t*-statistics taken from a bootstrap test with 5000 resamples. The result of R^2 for innovative use is 0.381 and of continuous use is 0.294, which means that the latent variable in the model explains 38% of innovative use variability and 29% of continuous use variability. Chin (1998) categorizes the *R*-squared of 0.19, 0.33, and 0.67 as low, average, and large. So, the R^2 in this research can be labeled as average.

According to the relationship between relational identity and innovative use in the model and following H1, relational identity's associated with innovative use ($\beta=0.190$, $t=3.544$, $p=0.000$). It means that when a student has close

communication with other members of this system, she/ he has more innovative in this system. According to the obtained results, relational identity was positively associated with students' continuous use of e-learning, which confirms H2 ($\beta=0.188$, $t=3.115$, $p=0.002$). It means that when a student has close communication with other members of this system, she/ he is more intends to use the e-learning system in the next semesters. In addition, this study showed that autotelic experience was positively associated with innovative use, and H3 has been approved ($\beta=0.405$, $t=7.973$, $p=0.000$). This means when the students feel that their abilities are in line with the environment, they innovatively use this system. Finally, according to H4, it is found that autotelic experience positively correlated with continuous use of e-learning ($\beta=0.344$, $t=7.459$, $p=0.000$).

Our most important results are regarding the moderating effects of relatedness between the variables. The results show that relatedness fails to moderate the relationship between relational identity and innovative use of e-learning and rejects H5a ($\beta=0.053$, $t=1.005$, $p=0.315$). In addition, according to H5b, it is determined that relatedness moderates the relationship between relational identity and continuous use ($\beta=0.194$, $t=4.500$, $p=0.000$). This means that the relationship between relational identity and continuous use is more robust at a higher level of relatedness (it has a steeper positive slope). Another hypothesis confirmed is H5c, which shows the relatedness moderator's effect between the autotelic experience and innovative use of e-learning ($\beta=-0.116$, $t=2.230$, $p=0.026$). Finally, the last hypothesis confirmed is H5d, which states that relatedness moderates the relationship between autotelic experience and continuous use positively ($\beta=-0.113$, $t=3.115$, $p=0.002$).

5 Discussion

Our study provides evidence for conceptualizing behaviors in e-learning by showing the impacts of relational identity and autotelic experience on students' continuous and innovative use of e-learning. Considering the limited studies conducted on students' intrinsic motivations and continuous and innovative use of e-learning, we have developed a new conceptual model and experimentally tested using data obtained from 384 students to see how students' relational identity and autotelic experience with the moderating role of relatedness influence their continuous and innovative use of e-learning. Our results confirmed that students' relational identity has a positive impact on their continuous and innovative use of e-learning. inconsistent with previous literature, Luo et al. (2014) found that relational identity was not significant moderation between the leader-member exchange, interpersonal justice, and employees' group commitment. But this finding is consistent with the results of previous research where studies have shown that students who have a higher relational identity than other students are more successful in the innovative use of e-learning systems (e.g., Pan et al., 2017). A plausible reason to explain this finding is that students with high relational identities have a sense of belonging to

e-learning and they tend to look to discover new and novel approaches to using e-learning. Our research also proved that relational identity has a positive influence on continuous use which is in line with prior studies (e.g., Burnham et al., 2003). When students have a high relational identity, they are more interested in connecting with peers and teachers, and in e-learning environments, since students can interact with others at any time and any place, they are expected to continue using e-learning (Chow & Shi, 2014).

Our analysis revealed that if students have the autotelic experience of using e-learning, this activity and this type of training will be pleasant for them, and they will be constantly involved in using e-learning with joy (Li et al., 2013). In this study, we found that students who interact well with the e-learning system and enjoy using it, try to use the e-learning system in innovative ways, such as interacting more with instructors and classmates, learning better, and using a variety of tools and multiple applications (Saga & Zmud, 1994). On the other hand, according to our results, students with autotelic experience of using e-learning which is largely integrated into this type of learning environment are engaged more than students in the traditional learning environment. This finding is consistent with previous research findings (Rovai, 2003). Furthermore, our research results determined that when students use e-learning, if they feel happy and enjoy using e-learning, it can lead them to continuous use e-learning which is in line with findings of prior studies (Venkatesh & Brown, 2001).

Khan et al. (2018) showed that relatedness was associated with the intention to use massive open online courses. Also, Sørebo et al. (2009) also revealed that relatedness has no significant influence on the perceived usefulness and intrinsic motivation of teachers to continue to use e-learning technology. Nikou and Economides (2017) found that perceived relatedness has a constructive influence on perceived usefulness and perceived ease of use of mobile technology acceptance. Nevertheless, contrary to the literature (e.g., Pan et al., 2017), we found that the innovative use of students with high levels of relatedness did not moderate the association between relational identity and innovative use of e-learning. Based on our findings, it was found that if students have an autotelic experience of the e-learning system, a high level of relatedness will be established between them and the system members, which will also strengthen the continuous and innovative use of e-learning (Deci & Ryan, 2008). In a study, Rezvani et al. (2017) found users' perceived relatedness was not associated with satisfaction while the relationship between enterprise resource planning users' perceived relatedness and perceived usefulness. Also, Visentin and Scarpi (2012) found that relational identification has not a significant influence on affective loyalty. One plausible reason why relatedness did not play a moderating role could be related to the fact that innovative use refers to the new ways of using e-learning systems (Chu et al., 2021) that require more higher-order thinking skills and high cognitive processing thinking skills to see how innovatively e-learning can be used (Lee, 2014) and it is not much relevant to the relatedness where there is need for being connected to and supported by others (Deci & Ryan, 2000).

6 Theoretical implications

Our study contributes to the existing theoretical literature on e-learning in different ways. First, this study developed and validated a theoretical model considering three theories including flow theory, SIT, and SDT, and mapping the relations among students' relational identity and autotelic experience with their continuous and innovative use of e-learning. Second, relational identity and autotelic experience identity are critical to attracting students' attention to using the e-learning system. Both are the most robust antecedents to the continuous and innovative use of the e-learning system. Third, relatedness acts as an influential moderator variable of the effects of relational identity and autotelic experience on continuous and innovative use. Fourth, this study represents a significant theoretical step forward from previous research on the acceptance of e-learning and its continued use using the two primary dimensions of relational identity and autotelic experience.

7 Practical implications

From a practical perspective, e-learning and its development, instead of merely using technology, help focus on how technology affects students' performance and their effectiveness in education. Students will also be encouraged to recognize the many benefits of e-learning if students can communicate well with other members and faculty while using the e-learning system and are confident that the system can be a good complement or alternative to traditional teaching. According to the SDT, one of the most significant implications is that designers should design e-learning systems as friendly pages to improve intrinsic motivation and its effects on continuous and innovative use. The reason for this is that people are more involved in an environment that is interesting to them, and they find themselves related to it (Roca & Gagné, 2008). In this regard, professors and educational administrators can provide and introduce e-learning tools and programs to students, providing an attractive environment for students to be more willing to use e-learning, especially in times like recent years when the world is facing the coronavirus and e-learning has become inevitable. Besides, teachers have a crucial role in creating a good e-learning experience for students by discussing and emphasizing the importance of e-learning in the classroom (Jang et al., 2016). To establish an effective relationship between students and the e-learning system, workshops or training sessions can be held at the beginning of each semester to introduce and use e-learning according to the university curriculum. As a result, when students make sure that the e-learning environment meets their needs well and is supported by the administrators, and if there is a problem, the administrators and web designers try to solve it, the students will be more participate in e-learning. For example, educators can run incentive programs to reward users who frequently use the e-learning system or encourage

more students to report unpleasant experiences (Cheng & Yuen, 2018). The relational identity and autotelic experience that students gain from the e-learning style is a way to support students' continued participation in e-learning, which is another practical contribution of this research. Educators can improve students' learning results by modifying the flow level (Tan et al., 2020). Instructors should encourage students to use the e-learning system through forums that facilitate internal and external discussions. When this autotelic experience is enhanced, the e-learning behavior is automatically embedded in the students, which leads to continuous and innovative use.

8 Conclusion, limitations, and future research

This paper presents a model for considering the factors that determine students' continuous and innovative use of e-learning and observes the moderating role of relatedness in the relationship between relational identity and autotelic experience with continuous and innovative use of e-learning. Our results confirmed that relational identity and autotelic experience are the factors that influence students' continuous and innovative use of e-learning and relatedness plays a moderating role in this regard. The findings of this study enrich the e-learning literature by highlighting the role of relational identity and autotelic experience factors in the innovative and continuous use of e-learning which has not been examined largely in previous studies. This research enhances our understanding of the critical issues influencing the post-adoption of e-learning systems (Joo et al., 2018). The study was built on flow theory, SDT, and SIT in e-learning and it showed a motivational sequence of a pleasant experience through using e-learning obtained from being in the flow and a sense of identity with this system and classmates and teachers derived from SIT.

In this study, a small number of universities participated which may affect the generalization of the results. In this regard, it is suggested that future research consider a broad scale of universities from different regions and countries to provide more reliable findings on a large scale. We collected our data from students, it is interesting to test the conceptual model presented in this research with a sample of teachers and discover their approach to the continuous and innovative use of e-learning. Moreover, in this study, only the moderating role of relatedness has been measured in the relationship between relational identity and autotelic experience with continuous and innovative use of e-learning. It is suggested that future studies examine other moderator variables such as students' cultural backgrounds. Finally, The role of control variables such as student background was not investigated in this research, it is suggested that future research consider these variables to present more reliable findings.

Appendix

Table 3 Descriptive analysis, factor loading, and reliability of the scales

Items	Construct	Factor Loadings	T-value	C α	CR	AVE	Item measurement Reference
Innovative Use							
IU1	I discover new uses of e-learning systems to enhance my department's performance	0.861	52.077	0.798	0.871	0.631	Huang et al., 2018
IU2	I apply e-learning systems in new ways to improve my department's productivity when given the opportunity to	0.835	41.149				
IU3	I use e-learning systems in novel ways to improve my department's business processes	0.834	33.425				
IU4	I discover new ways to apply learning systems to better manage my department's activities	0.624	18.978				
Continuous use							
CU1	I intend to use the e-learning system in the next semesters	0.892	66.953	0.872	0.921	0.796	Liao et al., 2007
CU2	I predict that I will continue to use e-learning regularly	0.885	44.283				
CU3	I will use e-learning soon	0.900	70.690				
Autotelic Experience							
AE1	I enjoy the experience of e-learning	Removed		0.607	0.834	0.716	Jackson & Marsh, 1996
AE2	My abilities match the challenges of the situation	0.884	57.750				
AE3	things just seem to happen automatically	0.806	27.911				
Relational Identity							
				0.880	0.908	0.622	Prentice et al., 1994; Ren et al., 2012; Sassenberg, 2002

Table 3 (continued)

Items	Construct	Factor Loadings	T-value	C α	CR	AVE	Item measurement Reference
RI1	I frequently communicate with some members of this community	0.762	24.590				
RI2	I feel some members of this community are very important to me	0.863	69.569				
RI3	Some members in this community are well acquainted personally with me	0.829	28.935				
RI4	I felt close to some members of this community	0.797	23.258				
RI5	Some members of this community have influenced my thoughts and behaviors. (dropped)	0.789	25.716				
RI6	I have many friends that come from this community. (dropped)	0.680	19.816				
Relatedness				0.893	0.913	0.538	Deci & Ryan, 2000; Stupnisky et al., 2018
REL1	I like the people I interact with	0.711	19.384				
REL2	I get along with people I come into contact with	0.721	18.209				
REL3	I pretty much keep to myself and don't have a lot of social contacts	0.756	23.863				
REL4	I consider the people I regularly interact with to be my friends	0.707	20.998				
REL5	People in my life care about me	0.764	33.496				
REL6	People I interact with daily tend to take my feelings into consideration	0.773	33.199				
REL7	There are not many people that I am close to	0.758	29.108				
REL8	The people I interact with regularly do not seem to like me much	0.737	19.665				
REL9	People are generally pretty friendly towards me	0.667	16.299				

IU = Innovative use, CU = Continuous use, AE = Autotelic Experience, RI = Relational Identity, REL = Relatedness

Declarations

Conflict of interest The authors declare that they have no conflict of interest.

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