The role of basic psychological needs satisfaction (BPNS) during the initial use of online teaching platforms on faculty members' continuance intention

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Abstract

Purpose – Based on self-determination theory (SDT), this study aims to investigate the motivational antecedents of faculty members' continuance intention of using online teaching platforms. For this purpose, we introduced a model incorporating basic psychological needs satisfaction (BPNS) and different motivational mechanisms.

Design/methodology/approach – Using a survey study of 312 faculty members, we examined the model by structural equation modeling (SEM).

Findings – The SEM results revealed a positive correlation between BPNS and continuance intention. Additionally, we illustrate the importance of different types of extrinsic motivation. By presenting an alternative model, we demonstrate that the initial-use-identified regulation (one type of extrinsic motivation) has an association with continuance intention (CI). However, this association loses significance if BPNS is present within the model. Moreover, we determined that there is no significant relationship between initial-use external regulation (another type of extrinsic motivation) and faculty members' CI for online teaching. Lastly, the results revealed that pre-use amotivation and intrinsic motivation impact CI through initial-use BPNS.

Research limitations/implications – The results suggest that decision-makers at educational institutions should consider that extrinsic motivation has different types with different impacts and that BPNS has a vital role in faculty members' intention to continue using online teaching platforms.

Originality/value – This study is novel because it reveals some details of extrinsic motivation effects by offering a model that combines BPNS and different types of motivation in two stages. It is important and rare that we concentrate on the almost neglected issue of faculty members' motivational perspectives in online teaching, while the literature mainly focuses on students' perspectives.

Keywords Continuance intention, Self-determination theory, Online teaching, Faculty members, Higher education

Paper type Research paper

Introduction

The landscape of higher education is rapidly evolving, with online learning poised for widespread adoption worldwide by 2025 (Palvia *et al.*, 2018). Triggered by the exponential growth of educational technologies, education leaders and administrators are increasingly exploring the broader integration of online technology into academia (Hofer *et al.*, 2021; Martin *et al.*, 2023). Central to this transition are faculty members, who play a pivotal role in implementing and utilizing online learning-teaching platforms in their universities (Mishra *et al.*, 2020). As central figures in the implementation of online learning, their intention to continue using these technologies, also known as continuance intention, is vital for the long-term success of educational technology.

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Continuance Intention, a key construct in technology adoption literature (Bhattacherjee, 2001), refers to individuals' intention to persist in using technology beyond the initial experience (Bhattacherjee, 2001). Understanding the factors influencing faculty's continuance intention is crucial, given their position as initiators and facilitators of students' engagement (Mahdizadeh *et al.*, 2008; Bolliger and Wasilik, 2009; Bolliger *et al.*, 2014; Erichsen *et al.*, 2014; Al-Samarraie *et al.*, 2018). However, we know that the amount of research on faculties' intention and motivation conducted to date is less than that in other groups in higher education (Daumiller *et al.*, 2020; Marasi *et al.*, 2022). According to the comprehensive study conducted by Rahman *et al.* (2017), satisfaction emerges as the most important determinant influencing continuance intention.

Based on the literature, the main variables investigated to influence faculty satisfaction with online teaching include motivation and instructor-student connections (e.g. Bolliger and Wasilik, 2009; Bolliger *et al.*, 2014; Stickney *et al.*, 2019; Tanner *et al.*, 2009; Wasilik and Bolliger, 2009). Although previous studies have demonstrated the paramount impact of motivation on faculty satisfaction with online teaching (Marasi *et al.*, 2022), these studies have not sufficiently investigated potential distinctions between various types of motivation (referred to as "regulation mechanism") nor explored the role of basic psychological need satisfaction in influencing the corresponding regulation mechanism. The motivational perspective explains why some faculty members use technology while others do not (Cutri and Mena, 2020). Accordingly, the central question of this study is: "How do different types of motivation and satisfaction influence faculty members' continuance intention in using online teaching platforms?"

Figure 1 provides an overview of this research's position within three distinct research areas in the online education context that help define our contribution. The illustration

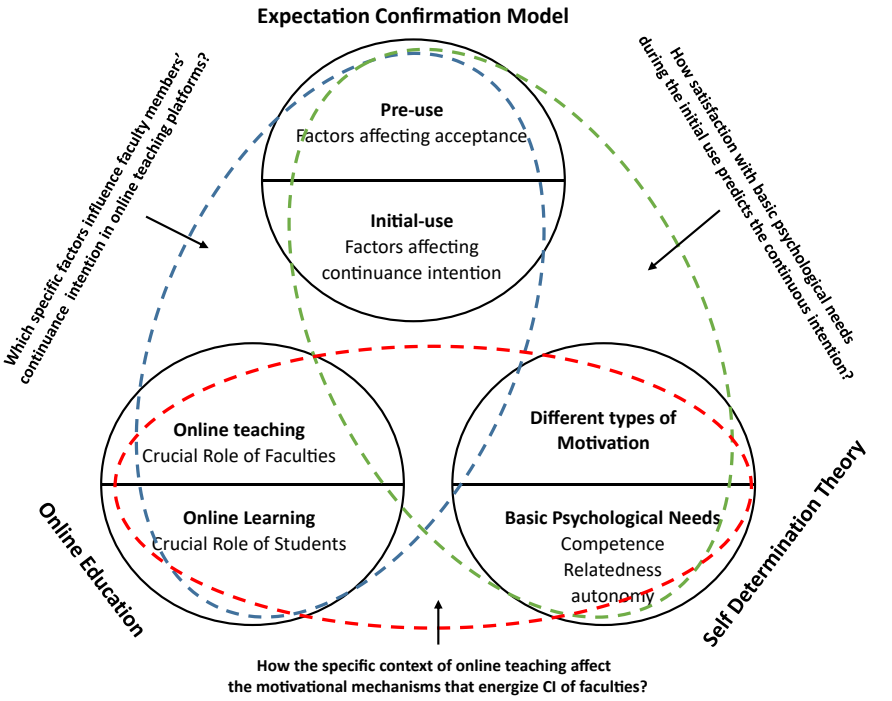

Figure 1.
Position of this research among different domains

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underscores the significance of examining and integrating these three bodies of literature to effectively address the motivational antecedents of faculty members' continuance intention. The interplay between technology and motivation raises the question: "How does satisfaction with basic psychological needs and motivational mechanisms predict faculty members' continuous intentions?" The intersection between the faculty viewpoint and technology raises the question: "Which specific factors influence faculty members' continuance intention in online teaching platforms?" Lastly, the interconnection between the instructor's viewpoint and self-determination theory (SDT) prompts us to explore the question: "How does the specific context of online teaching impact the motivational mechanisms that energize faculty members' continuance intention?" Thus, conducting a comprehensive review of these interconnected areas is vital for developing a robust model that captures the intricate interplay between motivational antecedents and faculty members' continuance intention. By integrating findings from each area, this study aims to make a substantial contribution to developing a model that explores the motivational factors influencing faculty members' intention to continue utilizing technology for online teaching.

This study contributes to the body of knowledge by providing new insights. For example, the outcomes of this study demonstrate that pre-use amotivation and intrinsic motivation have different relationships with basic psychological needs satisfaction (BPNS). Furthermore, by presenting an alternative model, we demonstrate that initial-use identified regulation (one type of external motivation) has an association with CI. However, this association loses significance if BPNS is present within the model. Moreover, the findings show that external regulation (another type of external motivation) does not have any significant relationship with CI.

The rest of the article is organized as follows. Before introducing our theoretical framework and providing reasons for the study's hypotheses, it is essential to offer justifications for the key variables of the model. Equally important is the establishment of a coherent link between these variables and the relevant domains mentioned earlier. Table 1 delineates the constructs, presents their definitions, references the theories from which they originate and elucidates the reasoning for their inclusion in the model. The next section presents the theoretical background and hypotheses development. Section 3 describes the methodology. Section 4 provides the research results. Section 5 provides discussions and implications. Section 6 outlines the limitations and provides some recommendations for future research.

Theoretical background and hypotheses development

Once a technology has been accepted and tested, the user has two options: continue using it or abandon it altogether. The expectation confirmation model proposes that technology satisfaction is crucial for predicting the constant use of technology after the initial-use experience (Bhattacherjee, 2001). The importance of "satisfaction with technology" in predicting continuance intention is consistently highlighted in existing research (Yan *et al.*, 2021). A meta-analysis study by Rahman *et al.* (2017) on the connection between satisfaction and CI in educational technology revealed strong path coefficients. Some studies (14 of the 30) had coefficients greater than 0.5, with the highest being 0.93. Yan *et al.* (2021) conducted a systematic literature review on CI for online technologies. They examined 147 articles on CI and emphasized that satisfaction is the most immediate antecedent. Due to the well-established nature of this relationship in the literature and its high anticipation, we do not propose a hypothesis for that.

Self-determination generally refers to one's motivational factors about autonomy and conscious choice to determine their actions (Deci *et al.*, 2017). Deci *et al.* (2017) proposed that three universal basic psychological needs (competence, relatedness and autonomy) drive

Constructs	Definition	Reference	Items derived from	Reason to include this construct in the model
Continuance intention	Individuals' intentions to keep using the technology beyond the initial user experience	Bhattacherjee (2001)	Expectation Confirmation Model (ECM)	Based on Bhattacherjee and Lin (2015) in the IT continuance context, rational users are more likely to continue using a given IT if they have positive intentions of IT continuance
Satisfaction	Emotions regarding users' previous usage of the technology			Based on Bhattacherjee (2001), satisfaction is the strongest predictor of continuance intention
Satisfaction of needs				
Autonomy	The desire of individuals to be the origin or source of their behaviors	Ryan and La Guardia (2000)	Basic Psychological Needs Theory of Self-Determination Theory (SDT)	We assumed that the satisfaction of these needs can help faculty members engage in using the technology and develop intention to continue their usage for keeping this satisfaction essential for their well-being and growth
Competence	One's propensity to interact effectively with one's environment and experience opportunities to exercise and express one's capacities			
Relatedness	Feeling connected with significant others, being cared for, or belonging to a social milieu			
Intrinsic motivation	The motivation to engage in a behavior because it is enjoyable, optimally challenging, or aesthetically pleasing	Ryan and Deci (2000)	Organismic Integration Theory (OIT) of Self-Determination Theory (SDT)	We assume these two types of motivation: no motivation for using technology due to a preference for traditional teaching approaches (mainly for senior faculty members), and enjoyment of exploring a new way of teaching (mainly for new generation faculty members)
Amotivation	The state in which person lacks motives to act			
Identified regulation	A relatively autonomous regulatory style characterized by the acceptance of regulation as one's own by relating the value of the external motive to an internal value			We employed these two regulations in accordance with the internalized value of online instruction for initial implementation, representing novel motivational regulations subsequent to exposing experienced professors and the younger generation to technology, with these regulations being particularly applicable during the initial-use of technology, rather than pre-use
External regulation	The least autonomous regulatory style which perform behavior because of external demand or possible reward. Such actions can be seen to have an externally perceived locus of control			

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Table 1.
Summary of theories that constructs derived from and constructs' definition

individuals' motivation to grow and change (Deci *et al.*, 2017). Satisfaction with these needs motivates individuals to explore and engage with their environment, acquire knowledge and skills, seek new challenges and opportunities and ultimately become self-determined (Deci and Ryan, 2000)

Satisfaction with technology vs BPNS

Basic psychological needs theory, a mini theory of SDT, hypothesized that *satisfaction of basic psychological needs* for competence, autonomy and relatedness is essential for intrinsic motivation, internalizing external motivation and psychological growth in any domain (Ryan, 1995). The need for competence refers to one's propensity to interact effectively with one's environment and experience opportunities to exercise and express one's capacities (Ryan and La Guardia, 2000). Tenure-track faculty members without online teaching experience are now required to transition to online teaching (Kyei-Blankson *et al.*, 2019; Gülbahar and Adnan, 2020). They need to interact effectively with the online platform and demonstrate their abilities (Cutri *et al.*, 2020). Faculty members must manage the stress of leaving their areas of expertise and avoid disrupting their professional identities. Cutri and Mena (2020) emphasized that it is important for faculty to manage stress and maintain their professional identities. The study conducted by Gülbahar and Adnan (2020) clarified the crucial significance of faculty members' competencies in online instruction. Therefore, satisfying the need for competence in online teaching platforms is crucial to prevent negative consequences in this regard.

The need for relatedness refers to feeling connected with significant others, being cared for, or belonging to a social milieu. Relatedness reflects "the desire to have others respond with sensitivity and care to one's experience and who convey that one is significant and loved" (Ryan and La Guardia, 2000, p. 150). When discussing the faculty's need for relatedness, we refer to their desire to feel connected with students on an online platform. Blundell *et al.* (2020) have identified that instructor-student interaction is important for instructor satisfaction in online courses, which is consistent with the findings of Bolliger and Wasilik (2009).

The need for autonomy reflects the desire of individuals to be the origin or source of their behaviors (Ryan and La Guardia, 2000). It is experienced when individuals perceive their behavior as self-endorsed. In this study, perceived autonomy refers to instructors' desires to self-initiate their actions about the acceptance of online teaching. Researchers utilized BPNS in the early steps of using SDT to study CI in online learning (e.g. Roca and Gagne, 2008). Similar to the study of Sørebø *et al.* (2009), revealing that teachers' BPNS could help predict their CIs, the current research suggests that the added variables from SDT are also crucial in explaining users' CIs in online teaching. Stupnisky *et al.* (2018) have applied SDT to studying faculty motivation and found that it fits conceptually well and serves as a valuable framework for empirical studies.

Satisfaction with the technology refers to the satisfaction of meeting the expectation of using technology with the operational definition: "emotions regarding users' previous usage of the information system." (Bhattacherjee, 2001, p. 359). It was measured using items such as "Based on my experience with online learning, I am delighted with the system." Many studies validated satisfaction as an essential determinant of continuance intention in online learning platforms after the initial-use experience (e.g. Alraimi *et al.*, 2015; Rahman *et al.*, 2017; Stickney *et al.*, 2019).

Although satisfaction (with the technology) and BPNS refer to feelings of satisfaction, they are distinct and related to different phenomena. To clarify the conceptual difference between these two concepts we brought a discussion. We argue that some faculty members may somehow be satisfied with basic psychological needs during the initial use but, at the end of this process, express that this technology had some shortcomings in providing aha

moments or the ambiance that happened in face-to-face teaching. Consequently, although their basic psychological needs were satisfied in "*the process*" during the initial use, they had relatively low satisfaction with the technology at the end because of "*the outcome,*" which might be different from what they expected from the technology. We argue that the more basic psychological needs are met through the use of online platforms for teaching, the more faculty members may become engaged and interested in using the technology consistently and effectively. This engagement, in turn, can contribute to the development of mastery in using the technology and result in greater achievements in their online teaching, ultimately leading to their satisfaction with the technology. Based on these arguments, we propose the following hypothesis:

H1. Satisfaction with the technology is positively associated with BPNS.

Initial-use regulation mechanisms

Satisfaction with technology is also influenced by initial-use motivation. Organismic integration theory, another mini theory of SDT, theorizes human motivation into three main categories of motivation: amotivation (lacking the motive to act), extrinsic (doing something because it leads to a separable outcome) and intrinsic (doing something because it is enjoyable, optimally challenging, or aesthetically pleasing) (Ryan and Deci, 2000). This theory maintains that some behaviors are derived from internalizing extrinsic motivation (Deci *et al.*, 2017). Extrinsic motivation has different types, including identified and external regulations, noteworthy that some regulations may co-exist in an individual (Howard *et al.*, 2021). Identified regulation refers to a relatively autonomous regulatory style characterized by the acceptance of regulation as one's own by relating the value of the external motive to an internal value (Deci *et al.*, 2017). Self-determined types of motivation (intrinsic motivation and identified regulation) may lead to positive outcomes, especially when performing non-routine tasks. On the other hand, external regulation involves actions that are controlled by external contingencies, such as rewards, punishment and social influence. According to SDT, external regulation comprises material external and social-external regulations (Ryan and Connell, 1989). In this study, we focused on social-external regulation, because the university required all faculty to teach online without any materialistic/monetary incentives and there was no variation regarding material external.

Previous research has highlighted the significance of motivation type in connection with specific outcomes (Howard *et al.*, 2021). For instance, Losier and Koestner (1999) discovered that voting behavior was more likely motivated by identified regulation, which reflects a sense of the action's importance rather than intrinsic enjoyment derived from the behavior. Many school tasks share a similar characteristic of being important but not necessarily enjoyable. After the exposure of faculty members (senior and the new generation) to online teaching platforms, some university regulations and instructions (for using this technology) were delivered in universities. Issuing administrative notifications and associated guidelines and training for online classes by universities provided opportunities for internalization of the technology's valence and different types of extrinsic motivation. Thus, we used external regulations and identified regulations (based on the internalized value of online teaching) for the initial use to reflect new motivational regulations that may be created and impact CI. In other words, using these two motivational regulations becomes more meaningful when the technology is introduced and utilized for a certain period as an initial-use rather than pre-use. Our assumption is supported by a meta-analysis by Howard *et al.* (2021), which highlights the different associations of identified regulation and external regulation with persistence in online education. Through differentiating between these regulation mechanisms, our aim is to investigate the importance of motivation quality and type, rather than solely focusing on quantity and magnitude.

In terms of defining satisfaction, we argue that when faculties are engaged with the technology through identified regulation, they perceive it as more useful, leading to higher levels of satisfaction (Guay *et al.*, 2000; Guay, 2022). According to external regulation, our argument is that when faculties use online platforms solely to comply with social influence and formal instructions, they lack the experience of enjoyment and engagement with the technology. As satisfaction with technology pertains to emotions based on previous use, and there is a lack of emotional engagement, we suggest that these constructs are negatively related. Based on these arguments, we propose the following hypotheses:

H2. Satisfaction with the technology is positively associated with the identified regulation.

H3. Satisfaction with the technology is negatively associated with external regulation.

SDT proposed that satisfying basic psychological needs increases the self-determined types of intrinsic and extrinsic motivation (Ryan and Deci, 2000). Accordingly, we argue that satisfaction of needs can facilitate the internalization of external motives like identified regulation. In other words, if the technology facilitates the satisfaction of needs, it can help faculty members gain the identified regulation. In the online teaching context, Roca and Gagné (2008) showed that perceived autonomy, competence and relatedness have a positive relation with perceived usefulness for students. This finding is consistent with a study conducted by Chang *et al.* (2017), which demonstrates that perceived autonomy and competence positively affected school teachers' willingness to adopt online teaching. Results of a multi-institutional study of factors influencing faculty satisfaction with online teaching revealed that two critical factors contributing to satisfaction are the role of technology itself and the quality of student-instructor relationships (Blundell *et al.*, 2020). Therefore, we propose the following hypothesis:

H4. Identified regulation is positively associated with BPNS.

Furthermore, some university regulations and instructions for using this technology are already delivered and promoted formally by the university authorities. Thus, some faculty use online platforms solely because of the formal instructions as external regulations. Based on the assumptions of SDT (Ryan and Deci, 2000), we suggest that BPNS in online platforms fosters the autonomous type of motivation by internalizing extrinsic motivation. Consequently, the more faculties internalize the technology's value, the less they use it based on an external regulation mechanism. These arguments lead to the following hypothesis:

H5. External regulation is negatively associated with BPNS.

According to these five hypotheses, we propose that BPNS is positively related to satisfaction with technology directly and indirectly through identified and external regulation. We present this mediation model in Figure A2 in the appendix.

Pre-use motivation

In the previous section, we discussed initial-use regulation mechanisms. However, the pre-use motivation may influence motivational regulation mechanisms at the initial-use phase. Based on the organismic integration theory (Deci *et al.*, 2017), there are different types of motivation categorized by self-determination. They range from most self-determined (intrinsic motivation) to an absence of self-determination (amotivation). Intrinsic motivation is the most self-determined type of motivation. When fully intrinsically motivated, individuals are entirely self-regulated, engage in activities out of interest, experience a sense of volition and function without the aid of external rewards and constraints (Nikou and Economides, 2017). For example, a fully intrinsically motivated faculty member would participate in online

teaching because it brings them feelings of satisfaction and pleasure that arise directly from the various activities embraced by using online teaching.

On the other side of the continuum, non-regulation is presented as a sign of amotivation. While online courses have become widely adopted in higher education, we emphasize that using online teaching platforms was not the "primary teaching method" for most faculties who participated in the study; likewise, most faculties worldwide (Ploj Virtic *et al.*, 2021). Therefore, there was little likelihood that they already had extensive experience using online teaching as their primary teaching approach before the university fully implemented the online teaching policy. In addition, while some senior faculty members' past experiences were based on the traditional teaching approach in face-to-face classrooms, the new generation of faculty members possibly was more eager to experience online teaching due to their familiarity with electronic technologies. Therefore, we assumed that there were two types of motivation: amotivation and intrinsic motivation. Our supposition aligns with the findings of Rosli and Saleh (2022), who identified intrinsic motivation and amotivation as crucial factors influencing the acceptance of technology in the context of online education.

The identified regulation in the context of this study refers to faculties' motivational regulation for relating the value of the external motive of using online platforms to their internal values of teaching students. Before using online teaching platforms, faculties may know that online teaching is a new way of teaching and helps students for effective learning. Thus, using an online platform for teaching became meaningful and valuable for faculty members with identified regulations as this motivational regulation helps faculty members to remind themselves why online teaching is helpful. The reason is that intrinsic motivation before using the online teaching platform may help faculty members become engaged in using it and consequently realize more benefits for using the platform in this specific context. This realization can be based on the internalization of the benefit of this platform, which is related to identified regulation (Ryan and Deci, 2000). Additionally, based on previous studies (Rosli *et al.*, 2022) and because intrinsic motivation and identified regulation are types of autonomous motivation (Deci *et al.*, 2017), intrinsic motivation before using the online platform is expected to have a positive relationship with identified regulation in the initial use. Accordingly, we suggest that:

H6. Identified regulation of using online technology is positively associated with pre-use intrinsic motivation.

As we mentioned earlier, non-regulation is presented as a sign of amotivation on the other side of the continuum. The pre-use amotivation in this context means a lack of motivation to use online platforms for teaching. Rosli *et al.* (2022) identified amotivation as a significant determinant of technology rejection. We propose that faculties that lack motives for this kind of teaching before being operationally exposed to the technology may not be engaged enough to use the potential capabilities of the technology. This disengagement may hinder faculty's experiences in using the platform's full options and the opportunities they can use for their online teaching, lowering their sense of autonomy in using the platform. Identified regulation involves awarding a conscious value to behavior to accept the action when it is personally important (Ryan and Deci, 2000). Those who lack the pre-use motivation to use this technology may not consequently be motivated in the initial use by the internal value. In other words, the pre-use amotivation may prevent faculties' engagement with the system essential for realizing the benefits of the technology. Therefore:

H7. Identified regulation of using online technology is negatively associated with pre-use amotivation.

External social regulation centers on avoiding anxiety, conforming to rules and facing punishments that individuals encounter from their external surroundings in relation to

technology usage. External regulation in this context refers to using online teaching to fulfill job requirements or gain external incentives. In this case, the locus of initiation is external to the faculties. In certain studies, findings indicate that individuals who are intrinsically motivated to engage in an activity may experience a decline in their pleasure and satisfaction over time (Boscolo *et al.*, 2013). This decrease could be attributed to the growing complexity of the task, which prompts a shift from intrinsic to extrinsic regulation (Guay *et al.*, 2000). Consequently, we argue that pre-use intrinsic motivation is positively related to external regulation. On the other hand, we propose that faculty members who lack motivation prior to using the platform take advantage of fewer opportunities to actively engage with it and fully appreciate its instructional benefits. Their interactions with this technology primarily stem from university regulations and their desire to comply with perceived social pressure.

H8. External regulation of using online technology is positively associated with pre-use intrinsic motivation.

H9. External regulation of using online technology is positively associated with pre-use amotivation.

Due to the flexible nature of computer-mediated online learning, faculties who exhibit intrinsic motivation during the pre-use phase can maximize their utilization of the technology. This increased usage offers them opportunities to enhance their proficiency as users, explore various teaching options embedded in the platform and connect with students through online features. Mastery of the technology contributes to fulfilling their fundamental psychological needs for competence, autonomy and connection, leveraging the capabilities provided by the technology. As a result of remote instruction, the utilization of online teaching platforms has evolved into a means of fulfilling these basic psychological needs. However, instructors who lack intent to use online platforms have limited chances of satisfying their psychological needs during the initial use phase. Our hypotheses align with Rosli *et al.* (2022) findings, which regard intrinsic motivation as a significant driver of desirable outcomes (e.g. persistence) and amotivation as a significant factor in unfavorable outcomes. These arguments lead to the following hypotheses:

H10. BPNS of using online technology is positively associated with the pre-use intrinsic motivation.

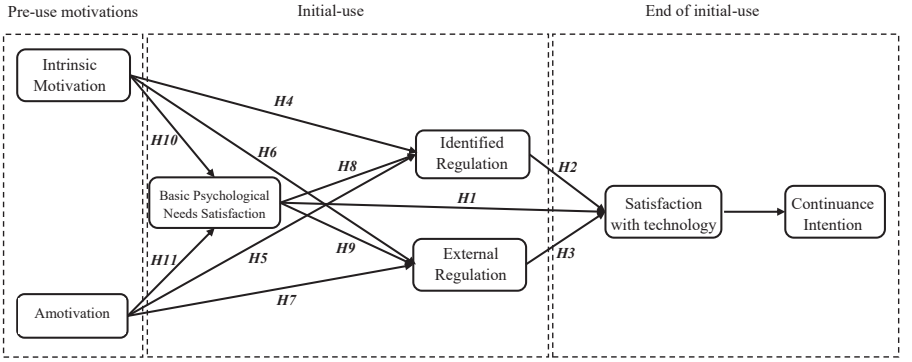
H11. BPNS of using online technology is negatively associated with the pre-use amotivation.

Figure 2 illustrates the theoretical model of our study, depicting the hypothesized relationships.

Methods

Sample and data collection procedure

The sample of this study consisted of faculty members of two major Iranian universities in Tehran. Using an online questionnaire in their email, they were instructed to respond about their experience during the switch and semester. The data collection period was 16 days from 8th to 23rd September 2020 at the end of the winter–spring semester of 2019/2020. After this period, 312 useable questionnaires were obtained, which included 21% women and 79% men, and the average respondent was 48 years old (26% below forty, 29% in their forties, 27% in their fifties and 17% above 60). According to online teaching experience, 72% had no experience and 28% experienced teaching at least one online course before the pandemic. They are 3% lecturers, 39% assistant professors, 30% associated professors and 28% full professors.



Source(s): Authors' own creation/work

Figure 2.
The proposed research model of continuance intention

Measures and data collection

Motivation measurement items were adapted from the Academic Self-Regulation Questionnaire (Ryan and Connell, 1989). The amotivation subscale was adapted from the Academic Motivation Scale (Vallerand *et al.*, 1992). Items for the need satisfaction scale were adapted from the Work-related Basic Need Satisfaction scale (Van den Broeck *et al.*, 2010). The items of satisfaction and CI (from the information system (IS)-continuance model) were adapted from Bhattacherjee (2001). A few changes in wording reflected the technology targeted in our study setting and the specific user context was applied. Because our questionnaire was in Persian, translation and back translation were used. Based on the recommendation by Schmitt (2011), five faculty members customized the wording of these questions to the context. We finalized the translation process after they agreed on the final questionnaire.

We used a questionnaire consisting of four sections. After our initial contact with university officials, we realized that it was impossible to have the universities' approval to use a longitudinal design and collect data during the process. Therefore, we used a specific format for designing the online questionnaire by separating the variables of each phase (pre-use, initial-use and end of initial-use) on different questionnaire pages. This format clearly distinguished the timing of the variables for our participants. Our questionnaire had three parts: the beginning of March, April to July and the middle of August. The first section contained demographic questions about participants. Four variables of individual differences were included as control variables: age, gender, online teaching experience and academic rank. At the beginning of the second section, we clarified that the items were about the pre-usage phase. Participants were requested to respond regarding their experiences last March when online teaching started in the universities. At the beginning of the third section, we mentioned that this part was about the initial use of online learning platforms from April to July. At the beginning of the fourth section, we declared that the items were related to participants' perceptions of their experiences in July (the end of initial use).

Data analysis

We followed a two-step procedure for data analysis where the measurement model was first developed and evaluated separately from the full structural equation model (Anderson and Gerbing, 1988). First, we examined the proposed measurement model's fitness and construct validity by assessing reliability, convergent validity and discriminant validity. Then, we examined the whole model to investigate the directions and strengths of the relationships

among the theoretical constructs for testing the hypotheses. Furthermore, we present and test mediation model with SEM. Gunzler *et al.* (2013), discussed about advantages of using SEM for mediation analysis. They present that: "SEM provides a more appropriate inference framework for mediation analyses."

Results

Scale validation

Before analyzing the structural model and testing the research hypotheses, we calculated the goodness-of-fit indices for the measurement model using maximum likelihood estimation (MLE). In the measurement and full models, the BPNS is measured using a single latent variable, including all measures of three needs. Though it may seem self-evident that, for example, the need for autonomy is not the same as the need for relatedness, the three needs are often aggregated into a single score to assess overall need satisfaction as proposed earlier (e.g. Deci *et al.*, 2001). Because of very high correlations between three needs with three latent variables (0.97 between competence and autonomy, 0.89 between relatedness and autonomy and 0.82 between relatedness and competence), we decided to aggregate them into a single latent variable. This aggregation has been justified by an argument suggesting that these needs are usually satisfied together (Van den Broeck *et al.*, 2016). The results of model fitness (χ^2/df = 1.99, comparative fit index (CFI) = 0.95, Tucker–Lewis index (TLI) = 0.94, normed fit index (NFI) = 0.91 and root mean square error approximation (RMSEA) = 0.056) indicate that our measurements model had an acceptable fit with the data (Hu and Bentler, 1999). Then we calculated the construct reliability coefficients of each factor. Reliability was assessed using Cronbach's alpha greater than 0.70. The indicator's estimated coefficient was significant for convergent validity on its posited underlying construct factor. We evaluated the measurement scales using three criteria: all item factor loadings (k) should be significant and exceed 0.7; average variance extracted (AVE) for each construct should be greater than 0.50; and the composite reliabilities (CR) for each construct should exceed 0.7 (Fornell and Larcker, 1981). Table 2 demonstrates the results.

Discriminant validity was assessed based on the squared correlations between variables and their extracted respective average variance. The average variance shared between a construct and its measures should be greater than the variance shared by the construct and any other constructs in the model to test the discriminant validity (Fornell and Larcker, 1981). The correlation analysis is shown in Table 3. The conceptual difference between satisfaction (with the technology) and BPNS was discussed earlier. In addition to that, and because of the high correlation (0.76), we also compared two competing models (the first specified with an integrated latent variable of both types of satisfaction and the second containing distinct latent variables for two types of satisfaction) to evaluate discriminant validity in statistical terms. For the first model, which includes one satisfaction construct with all measures, the fitness results are $\chi^2 = 293.7$, df = 44 (χ^2/df = 6.68), and for the second model, which includes two different constructs, results are $\chi^2 = 113.2$, df = 41 (χ^2/df = 2.76). The second model had better fitness with data supporting the empirical distinction of satisfaction with technology from BPNS.

We also found a high correlation between Ident-Needs (0.72) and Ident-Int (0.67), prompting a comparison of models. Model 1 combined Identified regulation and BPNS, while Model 2 had distinct variables. Model1 had $\chi^2 = 288.41$, df = 62 (χ^2/df = 4.65) and Model2 had $\chi^2 = 176.15$, df = 59 (χ^2/df = 2.99). Model 2 exhibited better fitness, confirming the distinction between identified regulation and BPNS. Moreover, we compared two more models: one with an integrated variable for Identified regulation and intrinsic motivation and the other with separate variables. The fitness for Model1 was $\chi^2 = 92.83$, df = 8 (χ^2/df = 11.6) and for Model2 $\chi^2 = 12.66$, df = 7 (χ^2/df = 1.81). Model 2 showed superior fitness, confirming the empirical differentiation of Identified regulation and intrinsic motivation.

Constructs	Construct code	Items loading	AVE	C.R.	Cronbach's α
Intrinsic motivation	int1	0.88	0.74	0.89	0.82
	int2	0.91			
	int3	0.79			
Amotivation	amot1	0.88	0.79	0.92	0.87
	amot2	0.90			
	amot3	0.89			
Satisfaction of needs	need1	0.84	0.70	0.96	0.95
	need2	0.84			
	need3	0.89			
	need4	0.79			
	need6	0.84			
	need7	0.87			
	need8	0.83			
	need10	0.80			
	need11	0.84			
	need12	0.82			
Identified regulation	iden1	0.89	0.83	0.94	0.90
	iden2	0.91			
	iden3	0.93			
External regulation	ext1	0.88	0.72	0.89	0.81
	ext2	0.83			
	ext3	0.84			
Satisfaction	sat1	0.88	0.73	0.89	0.81
	sat2	0.82			
	sat3	0.87			
Continuance intention	con1	0.92	0.76	0.90	0.84
	con2	0.86			
	con3	0.84			

Source(s): Authors' own creation/work

Table 2.
Construct reliability and convergent validity

Constructs	C.R.	AVE	Int	Amot	Needs	Ident	Ext	Sat	Cont
Int	0.89	0.74	*0.86*						
Amot	0.92	0.79	−0.376**	*0.89*					
Needs	0.96	0.70	0.573**	−0.462**	*0.84*				
Ident	0.94	0.83	0.666**	−0.451**	0.720**	*0.91*			
Ext	0.89	0.72	0.260**	0.048	0.124*	0.220**	*0.85*		
Sat	0.89	0.73	0.526**	−0.452**	0.749**	0.608**	0.168**	*0.85*	
Cont	0.90	0.76	0.410**	−0.248**	0.513**	0.388**	0.100	0.637**	*0.87*

Note(s): Int = Intrinsic motivation, Amot = Amotivation, Needs = Satisfaction of Needs, Ident = Identified regulation, Ext = External regulation, Sat = Satisfaction and Cont = Continuance intention
** correlation is significant at the 0.01 level (2-tailed)
* correlation is significant at the 0.05 level (2-tailed)
Source(s): Authors' own creation/work

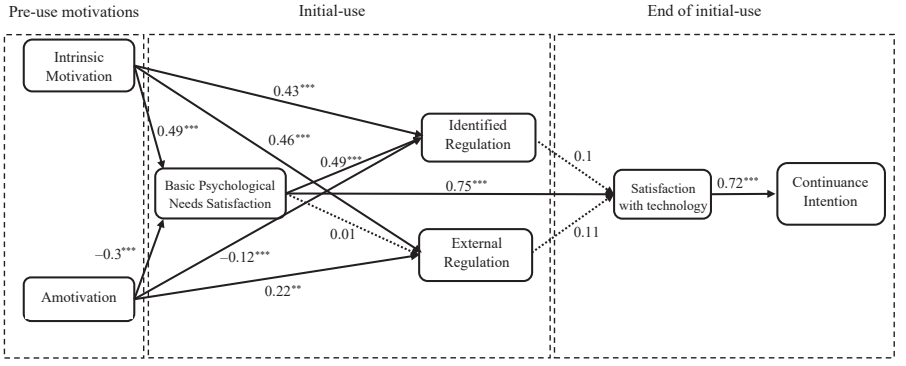
Table 3.
Inter-construct correlations and discriminant validity

To address the issue of common method bias, we conducted Harman's single-factor test using SPSS. The amount of variance extracted from our analysis was found to be 42%, which falls below the acceptable threshold of 50%, as proposed by Fuller *et al.* (2016). It is important to note that we were cognizant of this potential bias prior to gathering our information. In order to reduce the common method bias, we put measurement items of constructs which assumed to be theoretically related (like satisfaction with technology and BPNS) in different and distant sections of our questionnaire.

Structural equation modeling

The full model was tested to assess how well the model represented the data. We conclude that the goodness-of-fit indices (χ^2/df = 2.01, adjusted goodness-of-fit index (AGFI) = 0.83, NFI = 0.9, CFI = 0.95, TLI = 0.94 and RMSEA = 0.057) met the recommended levels, suggesting that the research model provided a good fit for the data, as the results and recommended values (Cangur and Ercan, 2015). The 11 hypotheses presented earlier were tested collectively using structural equation modeling (SEM) implemented via the method of MLE. These techniques allow for analyzing both a structural model (i.e. assessing relationships among theoretical constructs) and measurement models (i.e. assessing the reliability and validity of measures). Figure 3 illustrates the resulting path coefficients. Most of the paths are statistically significant in the expected direction. As a result of testing the model, we identified that the data supported 8 out of 11 hypotheses. Additionally, we test the mediation model which is presented in Figure A2 in the appendix. The goodness-of-fit indices. The goodness-of-fit indices (χ^2/df = 2.49, AGFI = 0.85, NFI = 0.9, CFI = 0.95, TLI = 0.94, RMSEA = 0.069) also met the recommendation levels.

As shown in Figure 3, seven hypothesized paths in the research model were significantly supported, with $p < 0.001$ (and the two paths with p values of 0.01). The CI variables had a high correlation (72%) with satisfaction. Our data support that the BPNS are significant predictors of satisfaction (H1). The logical explanation for rejections of another two predictors (identified and external regulations) is explained in discussions (H2 and H3). As predicted in the model, the identified regulations had a sizeable positive correlation with BPNS and pre-use intrinsic motivation and a negative correlation with amotivation (H6, H7 and H4). Moreover, our results did not support the relationship between external regulation and the BPNS (H5). Possible explanations will be provided in the next section. As predicted in our model, external regulation positively correlates with intrinsic motivation (H8). Furthermore, data showed that pre-use amotivation had a negative relation with BPNS and a positive relationship with external regulation, as predicted in our model (H9 and H11). Finally, data support the positive correlation between pre-use intrinsic motivation and The BPNS in the initial use (H10). Three hypotheses of the mediation model are not supported by data. A possible explanation for these non-significant indirect relations is the greatness of the direct relation between BPNS and satisfaction with technology.



Note(s): ⋯→ Non significant ⟶ Significant

*significant at $p < 0.05$, **significant at $p < 0.01$, ***significant at $p < 0.001$

Source(s): Authors' own creation/work

Figure 3.
Standardized path coefficients

Discussions and implications

The most important contribution of our study is the evidence provided regarding the relationship between initial-use BPNS and faculty members' satisfaction with technology and, consequently, the association between the latter with CI. It is noteworthy that, as presented earlier, we use one latent variable for three basic psychological needs satisfaction, including the student foci for the need for relatedness. We discovered a strong positive relationship between BPNS and CI. However, the scholars substantiated the impact of different needs individually in the previous research. Chang *et al.* (2017) showed that perceived autonomy and competence are positively related to school teachers' willingness to reuse online teaching. Similarly, Sørebø *et al.* (2009) found that satisfaction of the need for autonomy and competence predict teachers' intentions to continue using online teaching. In a similar manner, the investigation conducted by Salikhova *et al.* (2020) on the literature of SDT in online education reveals that digital education technologies offer various possibilities for fulfilling the need for autonomy.

The second contribution is about the role of pre-use intrinsic motivation and amotivation with initial-use BPNS. SDT proposes that BPNS is essential for internalizing external motivation, and consequently, researchers used BPNS as an antecedent for different types of motivation. The result of our study shows that pre-use intrinsic motivation and amotivation had relationships with initial-use BPNS in technology-enhanced education. While our finding is consistent with Rosli and Saleh (2022), who found that amotivation and intrinsic motivation were identified as the significant determinants of technology acceptance in online education, they could not provide evidence for relationships between pre-use motivation and BPNS at the initial-use. The reason might be related to the context. It is because the technology has some possibilities that using them affects BPNS. We provided evidence that the pre-use amotivation is detrimental to the subsequent stages of adaptation and the formation of continuous intention. The lack of pre-use motivation was negatively related to BPNS and, consequently, to CI.

In our study, we have observed a lack of significant correlation between identified regulation and satisfaction with technology. Nevertheless, our findings differ from previous research that has demonstrated a clear and positive relationship between identified regulation and satisfaction. For example, Sørebø *et al.* (2009) discovered a positive association between intrinsic motivation and satisfaction among teachers in online teaching. Similarly, Howard *et al.* (2021) identified a positive association between identified regulation and persistence among students in online education. Moreover, Guay (2022) provided support for a positive relationship between identified regulation and positive outcomes (e.g. satisfaction) among students in an educational context. We assumed that the possible explanation might encompass the influence of the BPNS on the model, which impacts the correlation. Deci *et al.* (2017) argue that: "Typically, researchers have used either the set of need satisfaction variables or the motivation variables, although a few studies have used both, in which case they have tended to predict the motivation variables from the need satisfaction variables, typically as mediating variables between independent variables and dependent variables." In our model, we used both. Based on SDT, BPNS is the main antecedent of internalizing extrinsic motivations (e.g. identified regulation). Consequently, the greater the fulfillment of needs, the more identified regulation emerges.

Therefore, we argue that the vital role of BPNS in the initial use phase has reduced the role of identified regulation in predicting other variables. To further examine the above idea, we excluded the BPNS variable from our model and tested a new model emphasizing regulation mechanisms. In this new model, presented in the appendix (Figure A1), the correlation between satisfaction and identified regulation is supported with $\beta = 0.52$. Results ($\chi 2/df = 1.96$, CFI = 0.96, TLI = 0.95, RMSEA = 0.05) indicate that new model had an acceptable fit with the collected data. Based on the above explanation, our model supports the positive

correlation between identified regulation and satisfaction with technology (H2), if BPNS is excluded from the model.

Furthermore, our model shows a positive direct relationship between pre-use intrinsic motivation and amotivation with initial-use extrinsic regulation. The first possible reason may be users' motivational journey from pre-use to initial use. Some faculties tend to get tired of carrying out a particular activity after a while and lose interest in it to some extent or realize that it no longer gives them the same pleasure they experienced earlier. Thus, the role of extrinsic motivation became salient after a period.

Finally, based on the results, no significant relationships exist between external regulations in the initial use with the BPNS and satisfaction with technology. Thus, these kinds of regulation mechanisms are not relevant in the context of online teaching in universities. Our findings are similar to previous research. Chang *et al.* (2017) found that external regulations had no significant relationship with CI.

Practical implications

First, based on our findings, if administrators provide contexts that facilitate BPNS, there is an excellent chance that the intention to continue using an online platform for teaching lasts longer. This facilitation can be addressed by incorporating features in online platforms that satisfy basic psychological needs within this context. Providing electronic guidelines of how a faculty member can master the technology using the features embedded in the platform to improve their sense of competence, giving feedback and mentoring on how one can be more competent in using the platform are some examples. Providing choices for using different platforms with different features consistent with the characteristics of courses (e.g. different platforms for lecture-based and case-based courses) can help satisfy needs for competence and autonomy. In addition, ensuring the use of a band-with Internet that fully supports high-quality video-based communication and incorporating emoji icons for communicating emotions in written messaging may also be examples of how the platform can help satisfy the need for relatedness.

Second, according to our results that supported no relationship between external motivation and CI during initial use, universities must be cautious about using regulations that only externally motivate faculty members to use online teaching technology. Our practical suggestion is that universities consider using training and promoting strategies to help elevate identified regulations of faculties on these platforms and demonstrate how this technology can enhance learning processes. In addition, we recommend providing technological components and product features that facilitate human interactions within the platform.

Finally, we observed that pre-use amotivation negatively influenced BPNS in the initial use, which is a means to reduce CI. These results initially advance our understanding of the importance of user motivation at the beginning of change, which could be affected by readiness for change incentives (Cutri *et al.*, 2020). Our research context has clearly illustrated the importance of the preparation phase. Accordingly, our practical suggestion for administrators is to design and implement interventions before or during initial use. On the one hand, they may provide faculty members with information or training to improve awareness and recognition of the importance and effectiveness of online platforms for teaching. Thus, the CI of online teaching can be improved by dismantling amotivation.

Limitations and recommendations for future research

The first and foremost is the impact of the COVID-19 pandemic on the study's design, which hindered us from collecting data in a longitudinal design. This cross-sectional study design

makes determining causal effects among the variables impossible. Future studies are recommended to gather longitudinal evidence to deepen our understanding of the interrelationships or causality among variables relevant to CI. Furthermore, the user's behavior is a dynamic phenomenon, and a longitudinal study design may help with more rigorous results.

Second, we conducted this research in a collectivistic and developing country. We assume that the relationship between instructors and students in a collective society tends to be beyond knowledge transfer, where relatedness is more critical for people (Markus and Kitayama, 1991). As a result, we suggest running a cross-cultural survey for future research to compare the results and test this assumption.

Third, the online teaching environment used in this research covered only one semester. Therefore, different results might be achieved in other research with different contextual situations. The findings of this study were obtained from only a single study that examined online teaching CI in targeted specific faculty members. CI should also be evaluated from instructional designers' and students' perspectives. Further research is expected to help generalize our findings and discussions to include different perspectives.

Fourth, while this study focuses on online teaching mode which are used in some other educational institutions (Palvia *et al.*, 2018), it is important to consider the hybrid teaching mode as well. Hybrid teaching, combining online and onsite teaching synchronously, has become more common during the pandemic period. It presents its own set of challenges and benefits that deserve attention and investigation.

Finally, in our study, like most universities around the world, many faculties had no or meager experience with online platforms (Ploj Virtic *et al.*, 2021). After COVID-19, almost all of them are experienced in using it. Therefore, the faculty's online learning experiences, habits, and previous usage of online teaching environments must be considered in future research.

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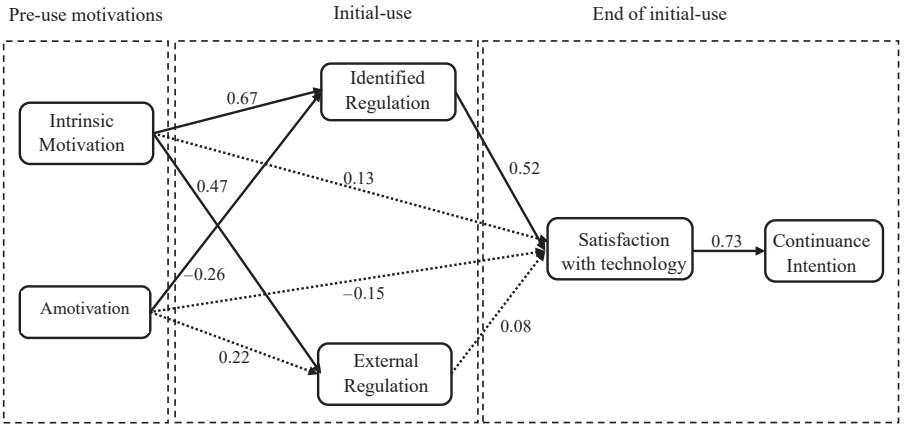
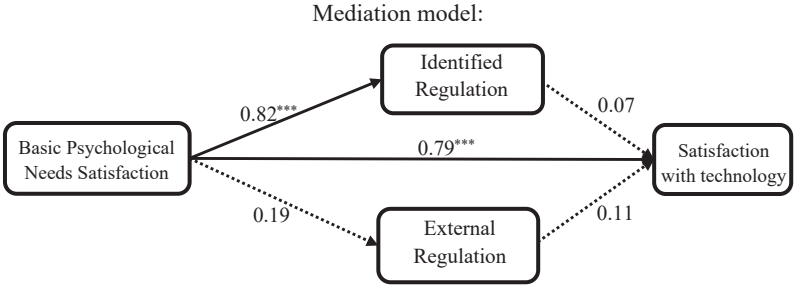
(The Appendix follows overleaf)

Appendix



Source(s): Authors' own creation/work

Figure A1. Standardized path coefficients of the second model (without BPNS)



Note(s): ⋯→ Non significant ⟶ Significant
*significant at $p < 0.05$, **significant at $p < 0.01$, ***significant at $p < 0.001$
Source(s): Authors' own creation/work

Figure A2. Standardized path coefficients

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