A Systematic Review on the Efficacy of Flow Experience on Continuance Intention in e-Learning: The Need for Overarching Evidence Synthesis

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Abstract: The application of the concept of flow in the context of the e-learning environment has widespread benefits. Creating a sense of flow can result in a positive learner experience and continuance in the e-learning environment. However, in the past two decades, applying the flow concept in analysing continuance intention in an e-learning context has been vague and complicated due to the broad nature and learners' behaviour. This includes the lack of certainty in operationalising the flow framework, theories, multitude of methods, or delivery settings. More specifically, uncertainty persists regarding the association between flow experience and continuance in e-learning. Hence, we intend to systematically review, synthesise and appraise the literature on the operationalisation of flow experience, methods used to study the flow concept, and the relationship between flow experience and continuance intention. We reported this systematic review according to the guidance of the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses). Electronic database searches on Scopus, Web of Science, JSTOR, and manual searches yielded 913 potential papers. Overall, n=20 peer-reviewed articles published between 2000 and 2021 satisfying the eligibility criteria were included. The synthesis identified that all the studies applied quantitative research design to examine the relationship between flow experience and continuance intention. While evidence also accumulated that no included studies have conceptualised flow experience considering all the nine dimensions, the lack of certainty in operationalising the flow framework applied in e-learning invites the attention of the researchers to validate the dimensions. Finally, most studies in the review exhibited a significant relationship between flow experience and continuance intention. The study provides a comprehensive synthesis and an in-depth analysis of the body of knowledge produced in the area of flow experience and continuance in the e-learning context, as it helps in providing implications for online marketers, learners, and academic institutions. The approach incorporated for synthesising evidence in this study lays a rigorous benchmark for conducting systematic reviews. This research study will be an asset for researchers and methodologists undertaking systematic reviews in e-learning.

Keywords: Flow experience, Flow theory, Continuance intention, e-Learning, Systematic review and continuance

1. Introduction

Transformation in information systems (IS) has enabled various institutions to deliver services and products effectively. Integration of IS into education facilitated better learning and contributed in overcoming traditional learning barriers such as lack of time and physical space (Panigrahi, Srivastava and Sharma, 2018). Given the consequential merits and convenience it bestows to students, instructors, and universities, e-learning has become an approachable and popular teaching alternative for most universities worldwide (Choi, Kim and Kim, 2007). Stationed in the hub of digital technology networks, educational institutions contribute decisively by disseminating knowledge that contributes to the lifelong learning of the learners (Sharma and Singh, 2023). Not astoundingly, e-learning has been experiencing tremendous growth at warp speed since its emergence in the mid-1990s (Muljana and Luo, 2019). The global e-learning market is expected to reach USD 370 billion by 2026

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at a CAGR of 8.56% from 2021 to 2026 (Reports, 2021). An enthralling number of individuals are embracing e-learning, evidenced to be a matter of fact, as e-learning is considered the primary medium for engaging students (Regmi and Jones, 2020). Also, leveraging technology in the education sector has been a fundamental goal of the government, academia, e-learning service providers, and educational institutions for better inclusivity; hence, enormous funds are being released to implement the e-learning avenues (Pushpanadham,2019).E-learning is defined as the "use of the internet to access learning materials; to interact with the content, instructor, and other learners; and to obtain support during the learning process, in order to acquire knowledge, to construct personal meaning, and to grow from the learning experience" (Muljana and Luo,2019; Regmi and Jones, 2020). Despite its advantages, such as equal access, cost-effectiveness, self-directed learning, and improved quality of education (Panigrahi, Srivastava and Sharma, 2018), literature demonstrates the high drop out among e-learners (Franque, et al.,2020). Learners are likely to drop from the learning process when the facilitator fails to enhance user experience and develop learning activities that drive completion of the committed subject. Different theories exist in the literature to analyse the adoption and continuance of behavior, and they serve as valuable lenses to draw more profound insights into phenomena (Davis, Bagozzi and Warshaw, 1989; Venkatesh, Thong and Xu, 2012). Some of the commonly used theories are the theory of planned behaviour, technology acceptance model, expectation confirmation model, and unified theory of acceptance and use of technology model, which serves as a causal link between attitude, intention and actual behaviour. Despite the wider applicability, these models disregard the intrinsic motivation viewpoint. Further, mere adoption is insufficient, considering the cost of acquiring a new learner rather than retaining the existing one (Guo, et al., 2015). Continuous use is necessary for recouping the investment in e-learning (Franque, et al.,2020).

1.1 Problem Statement

Retaining a learner in the e-learning platform has been challenging for service providers and academic institutions. Prior research works have posited that the success of e-learning majorly relies upon the learner's intention to continue with the e-learning platform (Guo, et al., 2015). Continuance intention refers to the intention of the learner to use e-learning after the initial usage (Franque, et al.,2020). Flow experience, which captures the subjective enjoyment of an individual while interacting with the technology, is the key factor in influencing outcomes, such as the learner's e-learning continuance. The flow theory proposed by Csikszentmihalyi has been widely applied in information systems-based studies mainly to assess online service users' 'optimal experience' (Akbari, et al.,2020; Khan et al.,2017). Csikszentmihalyi (1975) defines "flow" as "the state in which people are so involved in an activity that nothing else seems to matter." A state of flow is experienced when an individual participates in an activity, and it is so satisfying that the individual wants to repeat the activity continuously. Prior studies have empirically confirmed flow as the crucial antecedent of behavioral outcomes, such as technology adoption, enhanced exploratory behavior, satisfaction, effective learning, and continuous intention (Guo et al., 2015). Although seminal works have posited continuance intention and satisfaction as the positive outcome of flow. There is still no consensus that flow is the determinant of the continuance intention in e-learning (Buil, Catalán and Martínez, 2018; Cheng, 2014; Guo, et al., 2015; Hong, et al., 2019; Kim and Thapa, 2018; Rodríguez-Ardura and Meseguer-Artola, 2015; Zhang, et al.,2020). Additionally, researchers have examined the influence of the key factors on continuance, combining various theoretical underpinnings from various disciplines due to the complexity of human behavior (Lee, 2009; Zhang and Li,2019). Furthermore, studies have emphasised that flow experience lacks specific conceptualisation due to the multiple ways of operationalisation and measurement (Akbari, et al.,2020; Guo, et al.,2015; Hsu, Chang and Chen, 2012; Kim, Yoo and Yang, 2020; Wang and Lee,2020; Zhang, et al.,2020). As the demand for e-learning expands, education institutions experience elevating pressure to understand the mechanisms underlying the flow experience features of e-learning. The reason lies in the need to grab the advantage of novel education systems in providing students with the opportunity to promote e-learner continuance. As a result, lack of consensus on the relationship between flow experience and continuance intention, the further adaption of scales and theories from multiple disciplines and disparities in the conceptualisation of the flow mandated researchers to carry out a systematic literature review to provide a substantial overview of related literature.

2. Literature Overview

The prominence of flow experience on continuance intention in an e-learning settings:

Flow is a widely adopted measure by researchers to examine optimal experiences in varied scenarios (Csikszentmihalyi, 1975). It is a psychological state that results in a positive outcome. It is an intrinsically fulfilling state, described by complete submersion in a task and the feeling of everything falling into place, even in

demanding conditions (Csikszentmihalyi, 2002). Individuals experience flow when they participate in the activity for their own good, and the movement is so fulfilling that individual tend to repeat the behavior (Panigrahi et al.,2018; Wang and Lee,2020). Different levels of consciousness usually complement the state of flow in individuals, where they experience complete concentration, loss of self-consciousness, feelings of control and time distortion. The concept of flow is widely applied and empirically tested by researchers in marketing, psychology, sports, and education (Finneran and Zhang, 2003; Jackman, et al.,2020; Swann, et al., 2012). For instance, Bakker (2008) studied the effect of flow in the work setting and showed that it is positively associated with well-being, job satisfaction and enhanced productivity. Further, flow in sports is featured by deep engagement in the activities and optimal challenges, resulting in efficient physical and psychological performance (Jackson and Csikszentmihalyi, 1999). In the e-learning context, evidence suggests that learners experiencing flow likely persist in their activities and attain positive learning outcomes (Lakhal, Khechine and Mukamurera, 2021). Various researchers study flow as a unidimensional (Novak, et al., 2000) and multi-dimensional construct. Csikszentmihalyi (2002) conceptualized flow as a multifaceted construct comprising nine dimensions: a sense of control, autotelic experience, challenge-skills balance, loss of self-consciousness, immediate feedback, action awareness merging, clear goals, time distortion and concentration of the task at hand. Additionally, Bölen, Calisir and Özen (2020) in their review, pointed out that flow experience in IS settings lacks conceptual clarity due to numerous measures and applications. In the same vein, Guo, et al. (2015) emphasize that no efforts have been made to systematically examine the dimensions commonly used in measuring the overall flow experience.

Existing literature evidence reports that higher educational institutions form a promising setting to apply the flow concept as students majorly spend time in this environment, leading to boredom and disengagement (Goh and Yang, 2021; Hariguna and Akmal, 2019; Lakhal, et al., 2021). Flow encourages individuals to engage in challenging tasks that drive their curiosity, creativity, and personal growth. Prior studies in education exhibit optimal experience as the key determinant of satisfaction, learning outcome, and persistence (Bao and Huang, 2018; Khan et al., 2017). The application of the concept of flow is very apt in the context of the e-learning environment. E-learning platforms demand the learners to be self-regulated as they lack interpersonal communication compared to offline courses and warrant the learners to sort any issue independently. Lack of interaction results in feelings of isolation and loneliness, and learners tend to disengage or drop out from e-learning platforms (Al-Adwan, et al., 2021; Jung and Lee, 2018; Tri Prasetyo, et al., 2021; Yuan, et al., 2021). The efficacy of online platforms is plagued due to high attrition rates and lower continuance intention; however, massive technological development has significant potential to enhance the flow experience of the learners through various learning activities and tools. Therefore, Akbari et al. (2020) affirmed that flow theory had been applied in information technology to evaluate user behavior. Prior studies have reported the significance of flow experience as an indicator of technology acceptance, better exploratory behavior, technology use, and Continuance (Akbari, et al.,2020; Choi, et al., 2007; Guo, et al.,2015; Hsu, et al.,2012; Wang and Lee,2020). Karimi (2016) demonstrated that a greater adoption level of information systems could be achieved when systems are designed to capture the attention, arouse curiosity and enjoyment among the users. Persistence intention relies on the flow or immersion experienced during the use of technology (Panigrahi, et al.,2018). Furthermore, Kim, et al. (2020) reported flow as the critical construct to understand and enhance the online engagement of the customer. Ability to understand flow results in sustainable competitiveness and retention of the customer. The review of scholarly publications on the association between flow experience and continuance intention is beneficial for educators and course developers to develop strategies that drive the sustainability of e-learning systems. Furthermore, the review of flow dimensions contributes to a deeper understanding of flow in the realm of e-learning and aids in the advancement of standardised measurement scales. Hence, this study set out to determine the commonly used dimensions to measure flow experience (Choi, et al.,2007; Wei and Li,2021); and its influence on continuance intention among online learners (Guo, et al.,2015; Khan et al., 2017; Kim, et al., 2020; Wei and Li,2021; Zhang, et al.,2020).

The rationale of the study

The literature overview underscores that there is a steady expansion and acute need in gauging the conclusive outcome of relationship between flow experience and continuance intention paving ways to suggest measures on mitigating the attrition rate of users of e-learning. This review focusses on addressing the gap on conceptualisation of flow experience impacting on continuance intentions of e-learning users.

3. Research Methodology

The current study adopted a systematic literature review (SLR) method to identify and synthesize the relationship between flow experience and continuance intention in e-learning. Systematic review is known to be an efficacious form of research, which is associated with the scientific technique being "designed to locate, appraise and synthesize the best available evidence" in association with the research purpose, that enables to provide "informative and evidence-based" research (Regmi and Jones, 2020; Snyder, 2019; Xiao and Watson, 2017). The application of systematic review in business research has received attention in recent times. Existing literature evidence asserts that systematic review is a reliable and scientific way of conducting a literature review and serves as a foundation for future research (Dangelico and Vocalelli, 2017). The SLR for the current study is conducted by searching databases – like Scopus, Web of Science, and JSTOR. Primary search terms were e-learning, flow experience, and continuance intention using Thesaurus terms. This systematic review was conducted adhering to the guidelines of the Preferred *Reporting* Items for Systematic Reviews and Meta-Analyses (PRISMA) statement (Moher, et al., 2015; Shamseer, et al., 2015). A three-stage approach was employed, which comprised of the following stages: designing the review, performing the review by analyzing studies, and finally, writing the review results to provide the answer to the following questions.

RQ 1) *How does flow experience influence the continuance intention of the learner?*

RQ 1.1) *What are the outlines of current studies on flow experience and continuance intention in e-learning in terms of theoretical lenses and research approaches?*

RQ 1.2) *How the various studies conceptualized flow experience to understand the impact on continuance intention in e-learning.*

3.1 Data Collection

The study utilized peer-reviewed literature identified using three scientific databases: Scopus, Web of Science, and JSTOR. These provide an overview of the articles indexed from 20000 plus journals from a wide range of disciplines. A keyword search was performed on databases to recognize relevant articles using a number of words or phrases and Boolean operators. The final search strategy was "e-learning" **OR** "online learning" **OR** "electronic learning" **OR "**mobile learning" **OR** "MOOCs" **AND** "continuance" **OR** "continuing intention" **OR** "technology continuance" **OR** "continuance in e-learning" **AND** "Flow experience" **OR** "flow theory." The search query was similar under each concept but modified for use in other databases. The search field was restricted to title, abstract, and keywords (for detail search strategy refer the appendix table no: 3).

3.2 Inclusion and Exclusion Criteria

After recognizing keywords, the inclusion/exclusion criteria were defined to set the literature search limits compatible with the research scope. Research articles from the keyword search strategy were scrutinized based on the inclusion and exclusion criteria defined for the study using the PICOTS framework in Table no 1. The year 2000 was considered as the foundation as studies on e-learning conducted prior to 2000 are too obsolete, and the concept of flow was observed by researchers after the 2000s (Bölen, Calisir and Özen,2020).

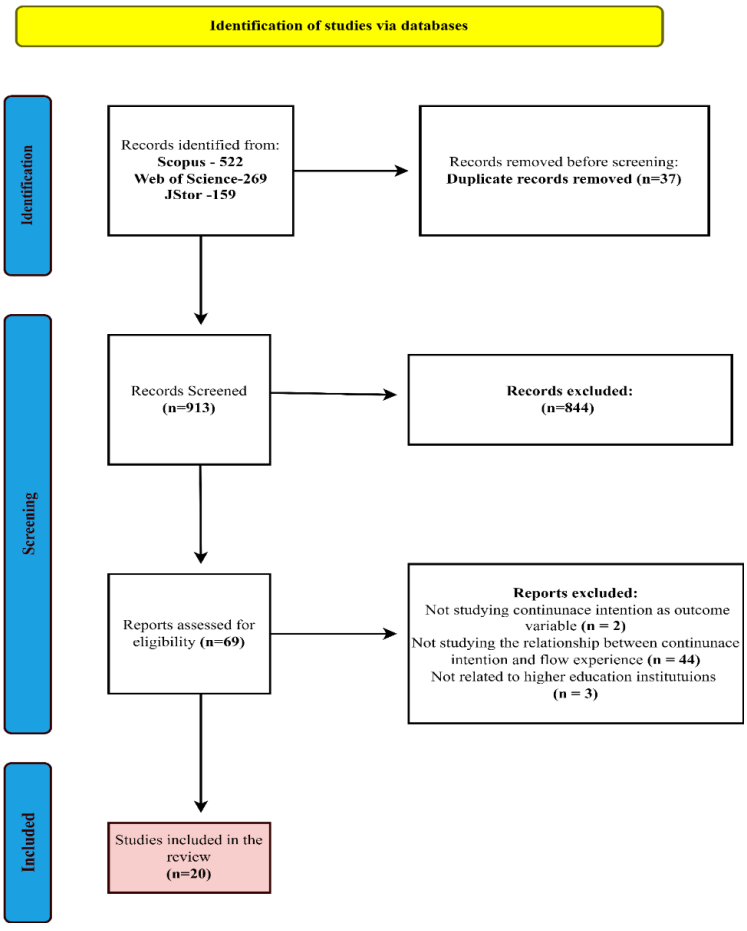
Table 1: Inclusion and Exclusion Criteria Based on PICOTS Framework

PICOTS Component	Inclusion Criteria	Exclusion Criteria
P- Population	Learners using e-learning platforms in higher education institutions. Higher education institutions include universities, colleges, professional schools in specialised fields, technical institutes and specialised institutes. E-learning included learning through virtual classrooms, online courses, hybrid learning, mobile learning, and virtual learning.	Learners using e-learning platforms in corporate organisations, school level education.
I- Intervention	Investigating the effect of flow experience	Not investigating the effect of flow experience
C-Comparator	None	

PICOTS Component	Inclusion Criteria	Exclusion Criteria
O - Outcome	Continuance intention as a dependent variable in e-learning context	Not continuance intention as an outcome variable of interest in e-learning context
T - Timeframe	Articles published between the period of 2000 to 2021 and those obtainable in full text written in English language	The articles that were not published between the period of 2000 to 2021 and those not available in full text after requesting the authors
S - Study Design	Quantitative and qualitative research studies	All the lectures, books, review articles and non-scholarly work published in the selected databases.

3.3 Search Results

The initial search strategy in all three databases resulted in 950 articles. Thirty-seven duplicates were eliminated, and articles came down to 913 articles. Further results were narrowed down with the application of the inclusion and exclusion criteria, 266 articles were not studying continuance intention as the outcome variable, 278 articles were not related to e-learning, 117 were not related to higher educational institutions, 175 were not examining the relationship between flow experience and continuance intention, 8 articles were not available even after full-text request and concluded with 69 articles for the full screening (ref figure no. 1).



Flow diagram demonstrating the search and selection process (Page et al., 2021).

Figure 1: Prisma Flow chart (version 2020)

3.4 Data Synthesis

Three authors (PR) (S) (LM) independently analyzed 69 articles, further leading to the elimination of the 49 irrelevant articles not adhering to the inclusion-exclusion guidelines. Finally, 20 articles were considered for the review, and most of them were quantitative in nature. In order to address the research questions of the study, the data of the articles considered for the review were synthesised following the coding scheme offered in the prior reviews of IS (Bandara, Miskon and Fielt, 2011). Three authors separately read the eligible articles and summarised the required elements of every article in the Microsoft Excel form that encapsulated details on "bibliographic information (title, year, author), country, research approach, sample size, theoretical underpinnings along with flow theory", flow dimensions and the relationship between flow experience and continuance intention, limitations and future scope". To achieve consistency, the authors compared their Excel sheets and discussed the differences in the weekly meetings during the coding process. The data was extracted to a single Excel file upon reaching a consensus by three authors and further verified by the fourth author as a critical reviewer. *Annexure Table 4* exhibits the detailed information of the articles finally considered for the review.

3.5 Quality Appraisal

The quality of the included study was assessed using the "QualSyst" tool proposed by Kmet, Lee and Cook, (2004). The tool comprised a set of 14 items for a quantitative study and 10 items for a qualitative study, a score between 0-2 was given for each question, with a final score determined by summing the overall score across the items and dividing them by the total possible sum (e.g., 28 for quantitative and 20 for qualitative studies) (Kmet, et al., 2004; Lee, et al., 2008; Maharaj and Harding, 2016; Regmi and Jones, 2020). All the articles considered for the review were quantitative; 75% was set as the threshold limit for considering the articles for the review based on the quality appraisal. A detailed overview of the quality appraisal of each study is provided in *Annexure Table 5*

4. Results

The following section provides the overview of the studies considered for the review as listed in *Annexure Table 4.* Overall, 20 articles were included in the review of which all the studies selected were quantitative in nature. The results section reports descriptive information about the publication period, geographical distribution, and key theoretical perspectives. Next, the study characterizes the commonly used dimensions to measure flow experience and the relationship between flow experience and continuance intention grounded on the prime focus of the selected articles.

4.1 Descriptive Findings

Publication period

Figure No: 2 exhibits the distribution of the selected articles per year for the review. As shown, the publication on flow experience studies in the e-learning context is very limited initially. The first publication was in 2009, with no publications in 2011 and 2013. Most studies were published in the year 2012, 2015,2016 and 2019. From 2020 it can be observed that the research on flow in e-learning is gaining momentum, the reason being the outbreak of the pandemic and gaining importance of online education for engaging learners.

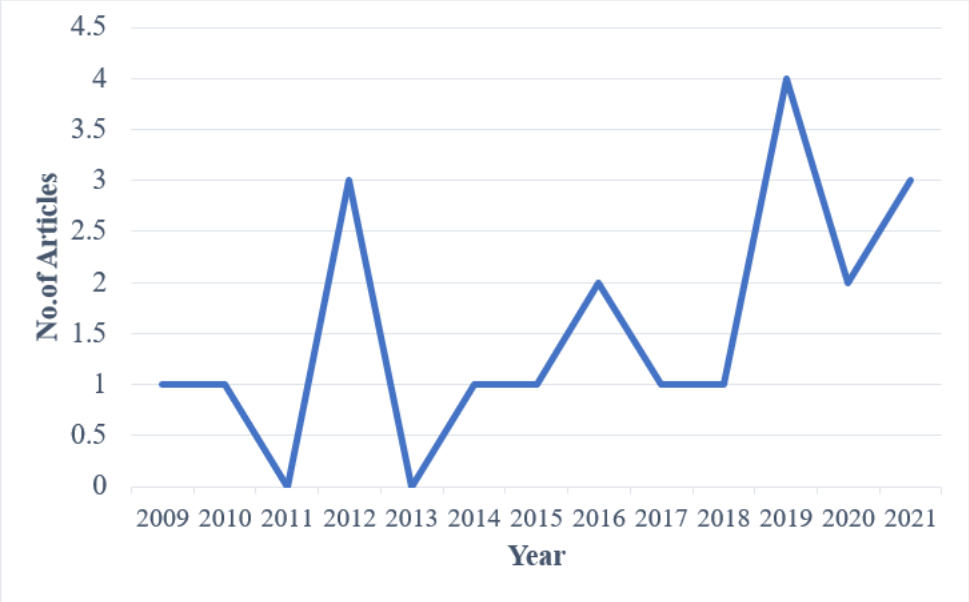


Figure 2: Publication trend of the included studies

Geographic distribution:

Figure No: 3 displays the overview of the geographical distribution of the selected studies for the review. It can be observed that most studies on flow experience in an e-learning context emerge from China (N = 7) and Taiwan (N = 7), followed by South Korea (N = 3) and then Europe (N = 2). In comparison, only one study emerged from Malaysia.

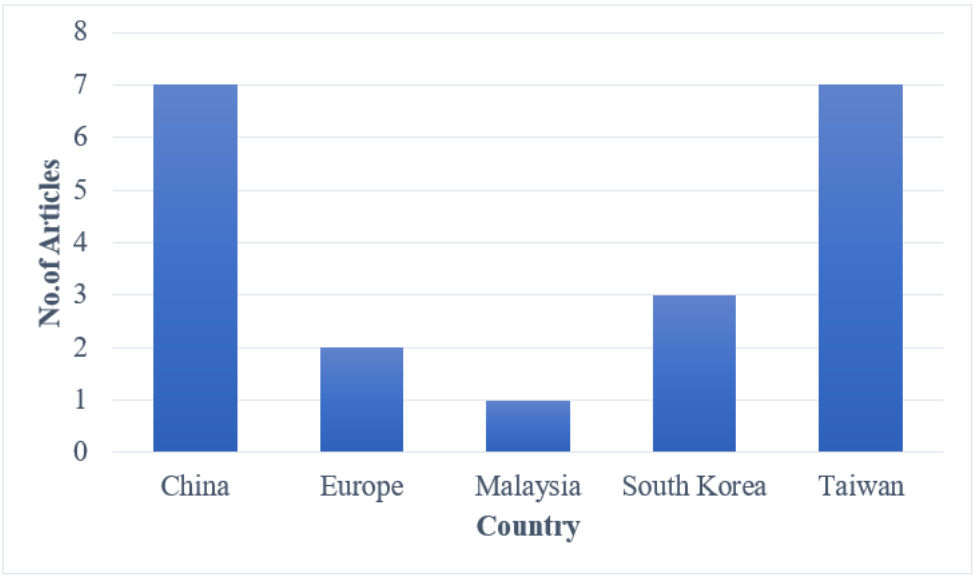


Figure 3: Geographical Distribution of the included studies.

The application of the theoretical framework assists in proposing the key theoretical and practical implications for the study. Table no: 2 shows the theoretical frameworks employed by the researchers to examine the relationship between flow experience and continuance intention in the e-learning context. Psychological, behavioral, and social sciences researchers adopt theoretical frameworks and models. The frequently used theories, with 15,7 and 5 articles each, were Flow theory, Expectation confirmation theory, and Technology Acceptance Model, respectively, in the review. Stimulus Organism and Response Framework, IS success model and Theory of Planned behavior are some more frameworks applied by the researchers. Flow theory was combined and studied with other theories by the researchers. Further, Rodríguez-Ardura and Meseguer-Artola

were the core contributors to the examine the impact of flow experience on continuance intention in the e-learning context.

Table 2: Overview of the included research articles

Sl. No	Citation	Theoretical Lenses	Flow Dimensions	Paths
1	(Lee, 2009)	Expectation–Confirmation Model (ECM), Technology Acceptance Model (TAM), Theory of Planned Behavior (TPB), and Flow Theory	Perceived Enjoyment, Concentration, and Perceived control	Concentration and perceived behavioral control exhibited a weak relationship, and Perceived Enjoyment did not influence Continuance Intention.
2	(Joo, Joung and Sim, 2010)	Flow theory.	Concentration	Significant
3	(Lee and Choi, 2012)	Flow theory.	Concentration	Insignificant
4	(Joo, Joung and Kim, 2012)	Flow theory.	Concentration and Enjoyment	Significant
5	(Chang, et al., 2012)	TAM Theory, the theory of self-determination and Motivation Theory	Perceived playfulness (concentration, curiosity, enjoyment)	Significant
6	(Cheng, 2014)	Expectation confirmation model (ECM), Flow theory, and Updated DeLone and McLean Information System (IS) Success Model	Cognitive concentration, Perceived Enjoyment, and Temporal dissociation	Significant
7	(Guo, et al., 2015)	Theory of telepresence and the Value-satisfaction-Continuance Intention (V-SAT-CI) model, Flow theory.	Concentration on the task at hand, loss of self-consciousness, sense of control, and time distortion	Significant
8	(Rodríguez-Ardura and Meseguer-Artola, 2015)	SOR (stimulus-organism-response) framework, Flow theory	Feeling of immersion	Significant
9	(Rodríguez-Ardura and Meseguer-Artola, 2016)	TAM theory, flow theory	Holistic state of immersion	Significant
10	(Rodríguez-Ardura and Meseguer-Artola, 2017)	Flow theory.	Holistic state of immersion	Significant
11	(Mohamad and Rahim, 2018)	TAM theory, Flow theory, and Social Cognitive Theory.	Enjoyment (holistic experience)	Significant
12	(Wang, Lin and Huang, 2019)	Expectation-Confirmation Theory and Flow Theory.	Enjoyment	Significant

13	(Hong, et al., 2019)	Inquiry learning model, Cognitive-Affective Theory of Learning, Theory of intelligence, Cognitive load theory, Flow theory, and Cognitive evaluation theory.	Focus of awareness, Lack of self-consciousness, Responsiveness to clear goals, Unambiguous feedback, and Sense of Control	Significant
14	(Zhao, Wang and Sun, 2019)	Flow theory, SOR paradigm	Time distortion and enjoyment	Significant
15	(Zhang and Li, 2019)	Expectation-Confirmation Model and Flow Theory.	Time distortion and Focused attention	Significant
16	(Zhang, et al., 2020)	Expectation Confirmation Model (ECM) and Flow theory.	Time distortion and Focused attention	Insignificant
17	(Cheng, 2020)	ECM, Flow theory, and HOT fit framework based on the information system success model.	Cognitive concentration, perceived control, perceived enjoyment, temporal dissociation	Significant
18	(Wang and Lin, 2021)	ECT and Flow theory	Skill challenge balance and enjoyment through immersion	Significant
19	(Goh and Yang, 2021)	Flow theory and TAM	Flow second-order reflective consists of concentration, enjoyment, telepresence, and control dimension.	Significant
20	(Wang, et al., 2021)	Technology Acceptance Model	Enjoyment, Concentration, and Control	Significant

Table no:2 presents variances in the conceptualization of flow experience. Debate persists on critical dimensions for examining the flow experience construct. Few researchers conceptualized flow experience as a unidimensional construct (Joo, et al., 2010; Lee and Choi, 2012; Mohamad and Rahim, 2018; Rodríguez-Ardura and Meseguer-Artola, 2016; Rodríguez-Ardura and Meseguer-Artola, 2017; Wang, et al., 2019) and few measured using multiple dimensions (Chang, et al., 2012; Cheng, 2014; Cheng, 2020; Goh and Yang, 2021; Guo, et al., 2015; Hong, et al., 2019; Joo, et al., 2012; Lee, 2009; Wang and Lin, 2021 and Wang, et al., 2021; Zhao, et al., 2019; Zhang and Li, 2019; Zhang, et al., 2020;). Therefore, each article considered for the review was examined to determine the commonly used dimensions to measure flow experience construct. The results of the study demonstrate that the majority of the articles considered for the review measured flow as a multifaceted construct. Interestingly it was observed that no study in the review employed all the nine dimensions proposed by (Csikszentmihalyi, 1990 and 2002). Out of 20 articles, 13 studied flow as a multi-dimensional construct, and the remaining 7 considered flow as a unidimensional construct. However, it was observed, in studies measuring flow as a unidimensional construct, each item of the construct signified one dimension of the flow.

It is quite evident that researchers have commonly adopted Concentration/feeling of immersion (Chang, et al., 2012; Cheng, 2014; Cheng, 2020; Goh and Yang, 2021; Joo, et al., 2010; Joo, et al., 2012; Lee, 2009Lee and Choi, 2012; Rodríguez-Ardura and Meseguer-Artola, 2015; 2016; 2017; Wang, et al., 2021), Perceived enjoyment (Chang, et al., 2012; Cheng, 2014; Goh and Yang, 2021; Joo, et al., 2012; Lee, 2009; Mohamad and Rahim, 2018; Wang, et al., 2019; Zhao, et al., 2019; Wang and Lin, 2021 and Wang, et al., 2021) and Time distortion (Zhang and Li, 2019 and Zhang, et al., 2020; Zhao, et al., 2019;) as key dimensions of flow. It was also noted that "focused attention" and "concentration" were often used synonymously in the literature. The operational definition of these constructs was analogous. Very few studies adopted context-specific dimensions such as the focus of awareness, unambiguous feedback, challenge skill balance, lack of self-consciousness, responsiveness to clear goals, and sense of control (Cheng, 2020; Guo, et al., 2015; Hong, et al., 2019; Lee, 2009; Wang and Lin, 2021; Wang, et al., 2021) to measure flow.

Though e-learning platforms are vulnerable to higher attrition rates and lower continuance intention, technology-mediated learning has the ability to provide learning activities to stimulate optimal flow experience

during the learning process. Understanding flow experience is vital for providing quality education and promote persistent intention to use e-learning, which solves the inherent problem of the e-learning platforms. However, prior studies examining the association between flow experience and continuance intention have failed to confirm the relationship due to the inconsistencies in the study outcome (Buil, et al., 2018; Cheng, 2014; Guo, et al., 2015; Hong, et al., 2019; Kim and Thapa, 2018; Rodríguez-Ardura and Meseguer-Artola, 2016; Zhang, et al.,2020). Therefore, the key objective of the review was to examine the existing literature evaluating the impact of the flow experience and continuance intention to use e-learning systems.

As presented in Table No: 3, out of 20 articles, 17 studies reported a significant relationship between flow experience and continuance intention to use e-learning platforms (Chang, et al., 2012; Cheng, 2014; Cheng, 2020; Hong, et al., 2019; Joo, et al., 2010; Joo, et al., 2012; Goh and Yang, 2021; Guo, et al., 2015; Mohamad and Rahim, 2018; Rodríguez-Ardura and Meseguer-Artola, 2015, 2016, 2017; Wang, et al., 2019; Wang and Lin, 2021 and Wang, et al., 2021; Zhao, et al., 2019; Zhang and Li, 2019;). Further studies by Lee and Choi (2012) and Zhang, et al. (2020) reported an insignificant relationship between flow experience and continuance intention. Lee (2009) adopted a multifaceted conceptualization of flow comprising concentration, perceived behavioral control, and perceived enjoyment. Concentration and perceived behavioral control exhibited a weak relationship with continuance intention, while perceived enjoyment insignificantly influenced continuance intention. Overall, most of the studies found a significant relationship between flow experience and continuance intention.

5. Discussion

The main purpose of the study was to systematically review, examine and synthesize the impact of flow experience on continuance intention in e-learning.

5.1 RQ 1) How Does Flow Experience Influence the Continuance Intention of the Learner?

Creating a sense of immersion or concentration can result in a positive learner experience and continuance in the e-learning environment. Furthermore, the existing studies report (Akbari, et al.,2020; Choi et al., 2007; Guo, et al.,2015; Hsu, et al.,2012; Jackman, et al.,2020; Wang and Lee,2020), in order to achieve educational goals, for productive outcomes and persistence, the learners need to get into a flow zone. Therefore, considering the number of studies and inconsistencies in the study results, the current review aimed to collectively analyze the relationship between flow experience and continuance intention to use e-learning platforms. 85% of the studies considered for the review (Cheng, 2020; Hong, et al., 2019; Goh and Yang, 2021; Wang, et al., 2019; Wang and Lin, 2021; Wang, et al., 2022; ; Zhang and Li, 2019 Zhao, et al., 2019) reported a significant relationship between flow experience and continuance intention to use e-learning platforms. Further studies by (Lee and Choi, 2012 and Zhang, et al., 2020) reported an insignificant relationship between flow experience and continuance intention. Lee (2009) adopted a multi-dimensional conceptualization of flow comprising concentration, perceived behavioral control, and perceived enjoyment. Concentration and perceived behavioral control exhibited a weak relationship, and perceived enjoyment insignificantly influenced continuance intention. Though, the majority of the studies in the review exhibited a significant relationship between flow experience and continuance intention. Most of the studies are cross-sectional and quantitative. The increase in the intensity and incidence of flow on learners can significantly impact the conative outcomes such as adoption intention, continuance intention, and usage intention in the long term, which is not captured in previously adopted research designs. Therefore, further research should avoid merely focusing on examining the associations and concentrate on understanding the long-term and short-term impact on the continuance intention employing advanced research designs. For instance, future research could assess the potential consequences of flow on the actual continuance behavior of the learner.

RQ 1.1) What are the outlines of current studies on flow experience and continuance intention in e-learning in terms of theoretical lenses and research approaches?

The review results exhibit that researchers have widely applied flow theory in e-learning settings. The first article exploring the correlation between flow experience and continuance intention was published in 2009. Since then, numerous articles substantiated the attention directed by the researchers in explaining how flow experience influences user's continuance intention. The rise in the number of publications is mainly justified due to the extension and application of technology in the education sector. Integration of education and technology has emerged to be a powerful tool that provides flexibility to an individual to enhance knowledge and skills irrespective of geographical boundaries and time frame (Agariya and Singh, 2012; Ehlers, 2009). The implementation of an e-learning system is happening at the world level due to its prominence and growing

importance in the present economy (Rahman, Rosman and Sahabudin, 2020). The availability of tools has simplified e-learning course creation, and therefore it is resulted to be popular and widely accepted ever since 2011. Students opt for such platforms for the upgradation of knowledge and skills in their subject domain. Some corporates leverage the advantage of e-learning and motivate the workforce to enroll in online courses to enhance their skills to meet their client's expectations (Liu and Pu, 2020; Ray, Bala and Dwivedi, 2019). A closer look on the reviewed studies manifested that all the studies applied quantitative research design for examining the relationship between flow experience and continuance intention; predominately survey method was adopted for the data collection. The review highlights the dearth of research employing qualitative and mixed approaches; therefore, it calls for further research adopting these research designs for an in-depth view of the concept. The majority of the review articles emerged from Asia (i.e., China, Taiwan, South Korea, and Malaysia), followed by Europe. However, no studies assessing the relationship between flow experience and continuance intention emerged from African, North American, South American, and Australian regions. Further research is required to collect data from other countries for the generalisability of the study findings.

Studies on e-learning have employed a variety of theories, such as the Expectation Confirmation Model (Bhattacherjee, 2001), Expectation Confirmation Theory (Oliver,1980), Technology Acceptance Model (Davis, et al.,1989), Unified Theory of Acceptance and Use of Technology (Venkatesh, et al.,2003;2012), Information Systems Success Model (DeLone and McLean, 1992; 2003) to mention a few. The findings of the review present that Flow Theory, ECT, and TAM are the most frequently used theories. These results are not unanticipated as behavioral theories are commonly applied by researchers to understand human behavior in information systems research (Chen, et al., 2022; Dhiman, Singh and Sarmah, 2022; Lee, 2021; Yang, et al., 2017; and Zhang and Yu, 2022). Most researchers integrated more than one theory in the context of e-learning. It can also be observed that researchers theoretically extended the scope of their conceptual framework by integrating the constructs from flow theory and other renowned behavioral theories (Cheng, 2014; Cheng, 2020; Lee, 2009; Mohamad and Rahim, 2018; Wang, et al., 2019; Wang and Lin, 2021; Zhang and Li, 2019; Zhang, et al., 2020;). Therefore, it can be understood that combining more than one theory is extensively practiced by scholars to enhance the theoretical models and provide a more comprehensive explanation of occurrences. Besides, a study by Hong, et al. (2019) combined Flow theory with multiple learning theories such as the Inquiry learning model, Cognitive-affective Theory of Learning, Theory of intelligence, Cognitive load theory, and Cognitive evaluation theory. Overall, the results of the review indicated that flow theory was commonly combined with behavioral theories for providing the overview on outcome of human behavior within the e-learning life cycle. The study by Wilkie (1994) reported that human behavior is complex and formed by the interplay of physical, emotional, and mental components. Considering this fact, researchers have employed flow theories along with the established behavioral theories to capture the emotional and cognitive attributes of human behavior.

RQ 1.2) How the various studies conceptualized flow experience to understand the impact on continuance intention in e-learning.

The systematic review revealed, to date, that there are ambiguities in conceptualizing the flow experience construct. Few researchers operationalized flow experience as a unidimensional construct (Joo et al., 2010; Lee and Choi, 2012; Mohamad and Rahim, 2018; Rodríguez-Ardura and Meseguer-Artola, 2015; 2016; 2017; ; Wang, et al., 2019) and few measured using multiple dimensions (Chang, et al., 2012; Cheng, 2014; Cheng, 2020; Goh and Yang, 2021; Guo, et al., 2015; Hong, et al., 2019; Joo, et al., 2012; Lee, 2009; Wang and Lin, 2021;Wang, et al., 2021; Zhang and Li, 2019; Zhang, et al., 2020; Zhao et al., 2019). Csikszentmihalyi (1990) and (2002) proposed a nine dimensions framework to assess the flow experience construct; however, no studies in the review conceptualized flow experience considering all the dimensions. Researchers to understand flow in e-learning have adopted Concentration, Perceived enjoyment, and Time as key dimensions based on the nine dimensions framework. Very few studies adopted context-specific dimensions such as challenge skill balance, the focus of awareness, lack of self-consciousness, responsiveness to clear goals, unambiguous feedback, and sense of control (Cheng, 2020; Guo, et al., 2015; Hong, et al., 2019; Lee, 2009; Wang and Lin, 2021 and Wang, et al., 2021) to measure flow. Considering the evidence, it can be interpreted that flow can be studied as a unidimensional and multi-dimensional construct. However, the lack of certainty in operationalizing the flow framework applied in e-learning captures the attention of the researchers to validate the dimensions. Therefore, further research is recommended to test the validity and advance the understanding in the context.

5.2 Future Directions for Research

The current study exhibited an increase in the application of flow experience in understanding the continuance intention of the e-learner. Based on the review, further directions for the research are recommended. Although

extensive research has been carried out, there's no consensus on the dimensions of flow experience (Akbari, et al., 2020; Jackman, et al.,2020; Kim, et al., 2019; Linares, Gallego and Bueno, 2021; Wei and Li, 2021). The vagaries and disagreement in the operationalization of the flow concept were highlighted in the study by (Abuhamdeh, 2020), The argument is protracted to the current review, as the findings of the review report incongruity in the flow conceptualization. Therefore, researchers should emphasize exploring key dimensions within the e-learning context in future investigations.

Moreover, the majority of the studies are quantitative in nature; therefore, meta-analysis is an effective approach to resolve the inconsistencies in the empirical findings and dimensions of the flow experience. It also opens the opportunity to further adopt qualitative and mixed approach methods to get an overview of the phenomena and propose novel theoretical implications. Furthermore, the intensity of the flow could be genuinely collected through a qualitative approach rather than an objective-based measure. Hence, the advanced research design and longitudinal study would enable the stakeholders to get the holistic overview flow mechanism.

Furthermore, lower persistence levels of e-learners implies that initial adoption does not assure continuance (Henderikx, et al., 2019; Recker, 2016). "Flow theory" was employed by the researchers to exemplify the flow's influence on the learners' continuance intention and engagement. The application of the flow directs the efforts to understand the "point at which learners make the decision to discontinue the e-learning platforms." Hence, future studies should conduct deeper investigations to study the impact of flow experience on temporary discontinuance, switching, and quitting independently.

Besides, available research showed that structural equation modeling was predominately employed as a statistical analysis approach in this context. The researcher also posits that human decision-making phenomena are complex in nature that cannot be solely and accurately analyzed using SEM (Albelbisi, 2020; Liu and Pu 2020; Panigrahi, et al. 2018; Todeschini, et al. 2020). Therefore, additional inquiry is warranted to adopt a multi-analytical approach by compounding analytical (SEM) and Artificial Intelligence techniques for accurate predictions of the cause-effect relationships. Also, the review found that ECT, ECM, IS Success model, and TAM are commonly adopted traditional theories to study the flow and continuance phenomena. However, Bhattacherjee and Barfar (2011) reasoned that the chances of misunderstandings and misapplications of theories are high when traditional theories are individually deployed. Therefore, instead of confining only to traditional theories, future studies should integrate theories from psychology, medical and other domain and explore the direct, mediating, and moderation impacts of the imported constructs for better results and insights.

5.3 Strengths and Limitations

One of the major strengths of this review was approach adopted for reviewing and evaluating the articles for examining the key dimensions of the flow experience. Further, the present study has been one of the first attempt to thoroughly examine the relationship between flow experience and continuance intention in the e-learning context through robust search strategy and comprehensive data extraction. The outcome of the systematic review offers valuable insights for policymakers, instructors and academic institutions. The review offers a clear understanding that learners' continuance intention takes place through optimal flow experience therefore, instructors need to direct more efforts in designing the courses that drive immersion among the learners, making the learning experience enjoyable. Further, course developers can consider flow experience as a means to advance their software designs to enhance the learner engagement. Overall, the review provides insights to practitioners, e-learning marketers, and course developers in creating a significant flow in terms of focused attention and perceived enjoyment. It is implied that learners use e-learning platforms sustainably when the strategic focus is directed toward enhancing the user experience with platforms. When exceptional importance is given to the learner's experience, flow experience results in an outcome such as learner satisfaction, brand loyalty, and persistence.

The review has few limitations that are worth addressing in future research. The review was restricted only to three databases (Scopus, Web of Science, and JSTOR), and no grey literature was searched; therefore, there is a possibility of missing the relevant articles. Further, the articles for the study were restricted to the e-learning applications in higher education institutions; there might be high possibilities of maturity and successful application of the e-learning platforms for organizational training and school-level learning. Hence it is worth acknowledging the need for further studies to conduct a systematic review to analyze the continuance intention of the employees and school students to get an overview of the study outcome. The articles for the review were restricted to the timeline from 2000 -2021, assuming that studies on e-learning conducted prior to 2000 are too obsolete and the concept of flow gained popularity after the 2000s.Further, the studies of the review were

restricted to the English language, and the conclusions could be vulnerable to language and publication bias, while the published articles in a foreign language have limited impact on the study reporting (Schmucker et al., 2017; Jackman et al.,2020).

6. Conclusion

The review contributes to the extant literature by providing an overview of the literature on flow experience and its association with continuance intention in the e-learning scenario. The findings of the review indicate the existence of ambiguity in the conceptualization of flow experience dimensions. In addition, results confirm that the incidence of flow on learners can have a significant impact on continuance intention in the long term; however, existing studies capture that only in the short term. Therefore, further research can validate and compare flow's long-term and short-term impact on the continuance intention employing advanced research designs. The study findings also reveal that flow theory is a promising theoretical underpinning for e-learning research. In addition, the review insights in terms of conceptualizing the constructs of flow experience dimensions revealed broader meaning, leaving scope for future researchers to narrow down the dimensions in specific to their significance level. Overall, the findings of the review facilitate the researchers to make more consequential progress in understanding the significance of the flow on continuance intention in the e-learning context. As a result, it enables the development of robust strategies by e-learning marketers, course designers, and academic institutions to increase the intensity and frequency of the flow state for e-learners, which could rectify the central problem of low persistency levels in e-learning platforms.

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Appendix 1: Tables 3-5

Table 3: Search Strategy

SS1	"e-learning" OR "online learning" OR "electronic-learning" OR "mobile learning" OR "electronic education "OR "virtual learning" OR "web-based learning" OR "internet-based learning" OR "technology-enhanced learning" OR "massive open online course" OR "MOOCs."
S2	"continuance" OR "continuance intention" OR "continuing intention" OR "technology continuance" OR "continuance in e-learning" OR "continuation intention"
S3	"Flow experience" OR "Flow theory."
SS4	"e-learning" OR "online learning" OR "electronic-learning" OR "mobile learning" OR "electronic education "OR "virtual learning" OR "web-based learning" OR "internet-based learning" OR "technology-enhanced learning" OR "massive open online course" OR "MOOC's" AND "Flow experience" OR "Flow theory."
SS5	"continuance" OR "continuance intention" OR "continuing intention" OR "technology continuance" OR "continuance in e-learning" OR "continuation intention" AND "Flow experience" OR "Flow theory."
Combined SS	"e-learning" OR "online learning" OR "electronic-learning" OR "mobile learning" OR "electronic education "OR "virtual learning" OR "web-based learning" OR "internet-based learning" OR "technology-enhanced learning" OR "massive open online course" OR "MOOC's" AND "continuance" OR "continuance intention" OR "continuing intention" OR "technology continuance" OR "continuance in e-learning" OR "continuation intention" AND "Flow experience" OR "Flow theory."

Table 4: Summary of the Studies Considered for the Review.

SL No.	Citation	Aim	Country	Sample Description and Sample Size	Study Design	Variables Observed	Analysis	Findings	Limitations/Future Scope
1	(Lee, 2009)	To develop an integrated model based on the technology acceptance model (TAM), expectation–confirmation model (ECM), theory of planned behavior (TPB), and flow theory to analyze the continuance intention to use e-learning.	Taiwan	Online Learners, 363	Quantitative analysis	User satisfaction, Perceived usefulness, Perceived Enjoyment, Concentration, Confirmation, Perceived ease of use, subjective norm, Perceived behavioral control, behavioral attitude, and Continued IT Usage Intention,	Structural equation modeling.	Flow experience was operationalized in terms of perceived control, perceived enjoyment, and concentration. Concentration and PBC were the weakest antecedents of the learner's continuance intention. However, perceived enjoyment insignificantly influenced continuance intention.	Need for a longitudinal study, limitations of common method bias, examine the moderating effect of gender, Apply the proposed study model in different e-learning contexts to enhance the generalisability of the findings.

SL No.	Citation	Aim	Country	Sample Description and Sample Size	Study Design	Variables Observed	Analysis	Findings	Limitations/Future Scope
2	(Joo, et al., 2010)	To empirically validate the relationship between Flow, internal locus of control, institutional support, and learning persistence.	South Korea	Students, 594	Quantitative	Internal locus of control, Learning flow, Institutional support, and learning persistence	Structural Equation Modelling.	The results of the correlation analysis revealed that flow experience directly influenced learning persistence. Students experiencing higher flow levels exhibited higher persistence intention. Additionally, Flow-mediated the relationship between internal locus of control, institutional support, and learning persistence.	Future studies need to consider other constructs that affect learning outcomes. Studies can utilize various other indices, such as achievement, participation, and satisfaction, as dependant variables, longitudinal study, Measure persistence in terms of actual completion and re-registration rates, and examine the moderating effect of the demographics on persistence.
3	(Joo, et al., 2012)	To empirically validate the cause-and-effect relationship between learning flow, satisfaction, self-regulated learning, and learning persistence of students	South Korea	Students, 594	Quantitative	Self-regulated learning, Learning flow, Satisfaction, and Persistence.	Structural Equation Modelling.	Learning flow exerted direct and as well indirect influence on learning persistence. Indirect influence on flow and learning continuance was intermediate by satisfaction. This implies that high persistence levels among learners are experienced when they are satisfied with the immersion levels.	Need to consider various other constructs, such as self-efficacy, locus of control, and learning objective orientation, as well as learners' extraneous factors, such as interactions among learners, the degree of community activation, and institution support. Self-reporting biases, Measure persistence in terms of actual completion and re-registration rates.

SL No.	Citation	Aim	Country	Sample Description and Sample Size	Study Design	Variables Observed	Analysis	Findings	Limitations/Future Scope
4	(Chang, et al., 2012)	To offer an extended TAM comprising intrinsic motivation and extrinsic motivation to continue using English mobile learning system (EMLS).	Taiwan	College students, 158	Quantitative analysis	Perceived ease of use, Perceived playfulness, Perceived convenience, Perceived usefulness, and Continuance intention to use.	Structural equation modeling.	Flow experience was operationalized as perceived playfulness. It had a greater influence on the continuance intention to use EMLS.	The need for examining the model on diverse systems and respondents, conducting cross country for analyzing the comparative effects, longitudinal study, and considering other external variables to predict the continuance behavior.
5	(Lee and Choi, 2012)	The aim of the study was to investigate the structural relationships between internal ALOC, Satisfaction, learning strategies, Flow, and student retention in e-learning.	South Korea	Students, 282	Quantitative	Internal ALOC, Learning Strategies, Satisfaction, Flow Experience, and Retention	Structural Equation Modelling.	The results of the current study exhibit the direct relationship between flow experience and learner retention was insignificant; however, flow-mediated the relation between learning strategies and learners' satisfaction.	Sample limited to one online course and one country, need for a longitudinal study to measure the actual retention behavior, Examine the influence of the cultural factors on retention behavior.
6	(Cheng, 2014)	The purpose of this article is to propose a hybrid model based on the , flow theory, and updated DeLone and McLean information system (IS) success model to examine whether quality factors as the antecedents to nurse beliefs affected nurses' intention to continue using the blended electronic learning (e-learning) system.	Taiwan	Students (nurses), 378	Quantitative	Information quality, System quality, Support Service quality, Instructor quality, Perceived Usefulness, Confirmation, Satisfaction, Flow, and Continuance Intention.	Structural Equation Modelling	Flow experienced by the learners directly influenced the continuance intention to use the e-learning system. When mechanisms developed make learners completely immersed in the e-learning system, facilitate continuance intention	The sample is restricted only to Taiwan; further studies need to enrich the model by considering all the dimensions of the flow experience and the demerits of self-reported measures.

SL No.	Citation	Aim	Country	Sample Description and Sample Size	Study Design	Variables Observed	Analysis	Findings	Limitations/Future Scope
7	(Rodríguez-Ardura and Meseguer-Artola, 2015)	The objective of the study was to develop a hybrid model of user experience in e-learning that captures its consequence in terms of re-usage intention.	China	Students, 2530	Quantitative Analysis	Perceived ease of use, Perceived usefulness, Perceived didactic resources quality, Instructor Attitude, Flow, Presence, Attitude towards use, and continuance intention.	Structural equation modeling.	The results of the study demonstrated a significant indirect effect of flow experience on continuance intention.	Other relevant indicators that predict continuance behavior need to be explored in future studies. Further investigation of the proposed model in the other educational environment to enhance the generalisability of the study findings.
8	(Rodríguez-Ardura and Meseguer-Artola, 2016)	To propose a comprehensive model that examines the influence of behavioral and affective e-learners' responses on actual continuance behavior.	Europe	Students, 2530	Quantitative analysis	Interactivity, Imagery, perceived interactivity, Spatial presence, Co presence, Flow, attitude, behavioral intention, and actual continuance.	Structural equation modeling.	The empirical findings support the significant and positive relationship between flow and continuance behavior.	Other relevant indicators that predict continuance behavior need to be explored in future studies. Further investigation of the proposed model in the other educational environment to enhance the generalisability of the study findings.
9	(Guo, et al., 2015)	To analyze the key antecedents of flow experience and examine mediating links between flow and continuance intention in the e-learning context.	China	Students, 244	quantitative- cross-sectional	Balance between challenge and skills of the task, Clear goals on task, Immediate feedback on task, Telepresence, Flow, Continuance intention, Perceived hedonic value, satisfaction, and Perceived utilitarian value.	Structural equation modeling.	The results of the study indicate flow experience as a significant indicator of continuance intention. Flow fully mediated the relationship between perceived hedonic value and continue intention; however, perceived utilitarian value partially mediated the relation between flow and continuance intention.	Restriction of the sample to undergraduate students of one university, Future studies need to re-examine the model in diverse technological contexts, conduct longitudinal studies and further explore the predictors and consequences of telepresence.

SL No.	Citation	Aim	Country	Sample Description and Sample Size	Study Design	Variables Observed	Analysis	Findings	Limitations/Future Scope
10	(Rodríguez-Ardura and Meseguer-Artola, 2017)	To empirically validate a conceptual model on Flow's antecedents and the outcomes in e-learning; and to provide evidence on the intermediate effects of Flow in e-learning—which comprises learners' affective, performance-related, and behavioral reactions.	Europe	Students, 2530	Quantitative	Challenge, Focused attention, Control, Presence, Flow, Positive affect, Academic performance, and continuance.	Structural Equation Modelling.	The study findings confirm that flow experience prompted continuance behavior.	Further studies can study achievement, level of participation, and satisfaction as outcome variables and collect samples from the universities that offer blended and pure e-learning programmes.
11	(Mohamad and Rahim, 2018)	To explore the drivers that influence learners to continue to use MOOCs. Additionally, to empirically validate the moderating effect of Internet Self-efficacy in the context of MOOCs.	Malaysia	Students,251	Quantitative Analysis	Usefulness, Enjoyment, MOOCs continuance intention, and Internet self-efficacy.	Structural equation modeling	The flow was studied as an intrinsic motivation factor, representing the learners' subjective feelings of pleasure, joy, affirmative holistic experience, and elation. Enjoyment directly influenced continuance intention, which implies that when MOOC platforms are interesting and interactive, learners are immersed in the learning activity, and it persuades them to stay longer.	Need for further studies to explore the moderating effect of enjoyment and usefulness also measure the percentage of content viewed as the alternative to measure the continuance intention. Influence on the outcome of the study due to self-selection bias.
12	(Zhang and Li, 2019)	The study intended to understand the students' experience of VRLs and explore the potential antecedents of the continuance intention of VRLs in engineering and scientific education.	China.	Students, 238	Quantitative analysis.	Flow experience, Perceived Usefulness, Confirmation, Satisfaction, and Continuance Intention.	Structural equation modeling	Flow experience significantly influenced students' intention to continue using virtual and remote lab learning facilities. The flow experience levels were higher for females than male.	Limited sample size affects the generalisability of the study findings, usage of only quantitative study, and self-selection bias due to self-reporting measures.

SL No.	Citation	Aim	Country	Sample Description and Sample Size	Study Design	Variables Observed	Analysis	Findings	Limitations/Future Scope
13	(Wang, et al., 2019)	The objective of the study was to adopt flow theory as a base to identify the predictors and outcome of flow experience, simultaneously to analyze the impact of flow experience on continuance intention to use English mobile applications.	Taiwan	Students, 289	Quantitative	Confirmation, Perceived Usefulness, User Satisfaction, flow experience, Perceived skill, Perceived challenge, and IS Continuance intention,	Structural Equation Modelling.	Among the all-predictors, flow experience was the core indicator of continuance intention. The findings of the study argue that when the course designers concentrate on flow experience, it strengthens the intention of continuance.	The sample is restricted to Taiwan, affecting the generalisability of the study findings, using only quantitative study and self-selection bias due to self-reporting measures.
14	(Hong et al., 2019)	To propose the "prediction-observation-quiz-explanation" (POQE) model that predicts the learners' continuance intention based on the cognitive and affective factors.	Taiwan	Students, 375	Quantitative	The incremental belief of intelligence, Intrinsic cognitive load, Green energy learning self-efficacy (GELSE), flow and continuance intention.	Structural Equation modeling.	The findings of the study reveal that flow experience was significantly correlated with the continuance intention of the learner. Flow experience was operationalized as time distortion, attention, and control. A higher level of the Flow experienced by the learners resulted in a higher intensity of continuance intention.	Most studies emphasize quantitative studies; therefore, further studies are required to conduct the qualitative study. Consider gender as moderating variable and examine the proposed model of the study in diverse domains.

SL No.	Citation	Aim	Country	Sample Description and Sample Size	Study Design	Variables Observed	Analysis	Findings	Limitations/Future Scope
15	(Zhao, Wang and Sun, 2019)	This study aimed to explore the influence of the technological and environmental features of MOOC s systems on continuance intention by applying the stimulus–organism–response (S-O-R) framework.	China	Students, 374	Quantitative analysis	Interactivity, Media richness, Telepresence, Social presence, Flow, Continuance intention, and Sociability	Structural equation modeling.	The findings of the study support flow as the critical indicator of continuance intention. The intention to continue using MOOC platforms was higher among the learners who experienced higher flow levels. The results of the study also indicate that flow experience mediated the impact of social presence, telepresence, and intention to continue.	Further research is required to analyze the study's findings by applying them to different e-learning contexts and populations. Consider utilitarian and hedonic constructs. Conduct mixed study and adopt triangulation methodology containing self-report data, in-depth interviews, and observation.
16	(Cheng, 2020)	The objective of the study was to propose an integrated model based on the expectation confirmation model, human organization technology fit framework, and flow theory to analyze the key antecedents that influence the continuance intention of medical students to use the e-learning system.	Taiwan	medical professionals, 368	Quantitative	Confirmation, Perceived Usefulness, Satisfaction, Flow experience, Technology task fit, Organisational support, Human-human interaction, Human system interaction, and Continuance intention.	Structural Equation modeling.	The results of the study reveal that flow experience with a cloud-based e-learning system resulted in continuance intention.	Need for cross-cultural study, qualitative study, longitudinal study. Additionally, to explore the further dimensions of the flow experience, such as cognitive concentration, perceived control, perceived enjoyment, and temporal dissociation.

SL No.	Citation	Aim	Country	Sample Description and Sample Size	Study Design	Variables Observed	Analysis	Findings	Limitations/Future Scope
17	(Zhang, et al., 2020)	The main objective of the study was to extend the expectation confirmation model incorporating flow experience to predict the Chinese student's continuance intention and satisfaction using virtual and remote labs.	China	Students, 240	Quantitative	Perceived Usefulness, Confirmation, Satisfaction, Flow (Time Distortion and Focused Attention), and Intention to continue	Structural Equation Modelling.	Flow experience was formed by time distortion and focused attention. There was no significant relationship between time distortion, focused attention (flow experience), and continuance intention. Authors assert that there are discrepancies in Flow as the direct or indirect predictor of continuance intention.	Data collection was restricted to only one university, and only two dimensions of Flow were contemplated. Need for testing the conceptual framework in another virtual context.
18	(Wang and Lin, 2021)	The study was designed to explore the factors that influence the intention of users to continue using mobile learning applications. Furthermore, the study examined the moderating impact of habit on continuance intention.	Taiwan	Users of e-learning, 229.	Quantitative	Users' Satisfaction, Perceived usefulness, Confirmation, Flow experience, Perceived skill, Perceived challenges, Habit, and Continuance Intention.	Structural Equation modeling	The findings of the study signify that continuance intention to utilize mobile learning applications was significantly influenced by flow experience. This implies that when course developers concentrate on designing applications that amplify enjoyability, it generates a positive feeling for learners to continue using the applications.	Future studies conduct longitudinal, qualitative, and compare users from diverse countries to test the generalizability of the findings of this study.

SL No.	Citation	Aim	Country	Sample Description and Sample Size	Study Design	Variables Observed	Analysis	Findings	Limitations/Future Scope
19	(Goh and Yang, 2021)	The study intended to investigate the relationship between e-learning engagement, flow experience, and continuance intention to use a learning management system through a mediated moderation interaction model.	China	Students, 92	Quantitative	Flow experience, E-learning engagement, Perceived ease of use, Perceived usefulness, E-learning engagement, and Continuance Intention	Structural equation modeling.	Flow experience was conceptualized as a second-order reflective construct comprising enjoyment, control, concentration, and telepresence as its dimensions. The results of the study exhibited that continuance intention was directly and indirectly influenced by flow experience. The moderating effect of e-learning engagement weakened the impact of flow experience on continuance intention to utilize e-learning systems.	The study was cross-sectional; the need for a qualitative study to capture cognitive, emotional, and cultural engagement; the need to conduct a study among working adults and senior learners to understand the influence of time, work-life balance, and organizational goals, learning styles, fatigue, and stress levels, collect the data from larger samples to generalize the outcome of the study. .
20	(Wang, et al., 2021)	The study aimed to analyze the relationship between perceived usefulness, integrative motivation, flow, and continuance intention of Chinese students to utilize English learning applications.	China	Students,500	Quantitative	Perceived Usefulness, Integrative Motivation, Continuance Intention, and Flow. Gender, grade, majority, using frequency and using experience (As control Variables)	Structural Equation Modelling	Flow significantly positively correlated with the continuance intention. In addition, flow experience mediated between perceived usefulness and continuance intention. The affirmative perception about the usefulness of the language learning applications promotes flow experience and continuance intention.	The study was cross-sectional, data was collected on self-reported measures, and further research can conduct an experimental study and replicate it to a diverse population for generalisability. Need to consider additional variables as mediators (perceived flexibility advantages)

Table 5: Critical Appraisal of Included Studies

Critical appraisal of included studies

[2-YES, 1-PARTIAL -1, 0 - NO, NA- NOT APPLICABLE]

Quantitative studies																	**Overall Quality score**
Checklist/ First author and year	Question/objective sufficiently described?	Study design evident and appropriate?	Method of subject/ comparison group selection or source of information/input variables described and appropriate?	Subject (and comparison group, if applicable) characteristics sufficiently described?	If the interventional and randomallocation was possible, was it described?	If interventional and blinding of investigators was possible, was it reported?	If interventional and blinding of subjects was possible, was it reported?	Outcome and (if applicable) exposure measure(s) well defined and robust to measurement / misclassification bias? means of assessment reported?	Sample size appropriate?	Analytic methods described/justified and appropriate?	Some estimate of variance is reported for the main results?	Controlled for confounding?	Results reported in sufficient detail?	Conclusions supported by the results?	Summary Score		
(Lee, 2009)	2	2	2	1	NA	NA	NA	2	2	2	2	2	2	2	Total sum (21)	Total possible sum (22)	Quant 0.95
(Joo et al., 2010)	2	2	2	1	NA	NA	NA	2	1 not describe 7selected samples	2	2	NA	2	2	Total sum (18)	Total possible sum (20)	Quant 0.90
(Lee and Choi, 2012)	2	1	2	2	NA	NA	NA	2	2	2	2	NA	2	2	Total sum (19)	Total possible sum (20)	Quant 0.95
(Joo et al., 2012)	2	2	1	2	NA	NA	NA	2	2	2	2	NA	2	2	Total sum (19)	Total possible sum (20)	Quant 0.95
(Chang et al., 2012)	2	2	1	2	NA	NA	NA	1	1 not describe how they selected samples	2	2	NA	2	2	Total sum (17)	Total possible sum (20)	Quant 0.85
(Cheng, 2014)	2	2	2	2	NA	NA	NA	2	1	2	2	NA	2	2	Total sum (19)	Total possible sum (20)	Quant 0.95

(Wang and Lin, 2021)	(Cheng, 2020)	(Zhang et al., 2020)	(Zhang and Li, 2019)	(Zhao, Wang and	(Chao Hong et al., 2019)	(Ting Wang et al., 2019)	(Mohamad and Irwan	(Rodríguez-Ardura and	(Rodríguez-Ardura and	(Guo et al., 2015)	(Rodríguez-Ardura and
2	2	2	2	2	2	2	2	1	2	1	2
2	2	2	2	2	1	2	1	2	1	2	1
2	1	2	2	2	2	1	1	2	1	2	2
2	2	2	2	2	2	1	1	2	2	2	2
NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2	2	2	2	2	2	2	2	2	2	2	2
1	2	2	1	2	2	2	2	2	2	2	2
2	2	2	2	2	1	2	2	2	2	2	1
1	2	1	1	1	2	2	2	2	2	2	2
NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2	2	2	2	2	2	1	2	2	2	2	2
2	2	2	2	1	2	1	1	2	2	2	2
Total sum (18) Total possible sum (20)	Total sum (19) Total possible sum (20)	Total sum (19) Total possible sum (20)	Total sum (18) Total possible sum (20)	Total sum (18) Total possible sum (20)	Total sum (18) Total possible sum (20)	Total sum (16) Total possible sum (20)	Total sum (16) Total possible sum (20)	Total sum (19) Total possible sum (20)	Total sum (18) Total possible sum (20)	Total sum (19) Total possible sum (20)	Total sum (18) Total possible sum (20)
Quant 0.90	Quant 0.95	Quant 0.95	Quant 0.90	Quant 0.90	Quant 0.90	Quant 0.80	Quant 0.80	Quant 0.95	Quant 0.90	Quant 0.95	Quant 0.90

(Thye Goh and Yang,	2	1	2	2	NA	NA	NA	2	1	2	1	NA	2	1	Total sum (16) Total possible sum (20)	Quant 0.80
(Wang et al., 2021)	2	2	2	2	NA	NA	NA	2	1	2	1	NA	2	2	Total sum (18) Total possible sum (20)	Quant 0.90
Quality interpretation	For quantitative articles: strong (summary score of >0.80), good (summary score of 0.71-0.79), adequate (summary score of 0.50-0.70), and limited (summary score of <0.50), and For qualitative articles: a score of ≥0.55 as an 'adequate quality article. A score of ≤0.54 was deemed as a 'low-quality article.														

Source: (Kmet et al., 2004; Lee et al., 2008; Maharaj and Harding, 2016; Regmi and Jones, 2020)

