

User Acceptance of eLearning: A Conceptualized Hybrid Model Integrating Technology Acceptance Model and Expectancy Confirmation Model

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ABSTRACT

The rapid expansion of eLearning has significantly transformed the educational landscape, offering flexibility and access to a wider learner base. Understanding user acceptance is important for the sustainability and success of eLearning systems. The Expectancy Confirmation Model (ECM) and Technology Acceptance Model (TAM) provide frameworks to study these dynamics. TAM emphasizes two key factors: Perceived Usefulness (PU) and Perceived Ease of Use (PEOU), which influence the acceptance of technology by users. ECM focuses on user satisfaction by examining initial expectations and their confirmation through actual usage, which directly influences continued usage intentions. Sustainability in eLearning encompasses not only environmental and economic factors but also the preservation of long-term engagement and efficacy. The purpose of this study is to propose a conceptual hybrid model of eLearning using the extended Technology Acceptance Model and Expectancy Confirmation Model for measuring sustainability based on the exhaustive review of the past literature and their critical analysis. Owing towards diversity of problems prevalent in the literature, it is evident that the variables affecting sustainability of eLearning are multifarious. This prototype maps out the key variables involved in the study of e-learning effectiveness and the communications among these variables. It is expected that this conceptual model will support researchers in developing upcoming evaluative studies which are both sufficiently robust and holistic in design.

Key words: eLearning, User Acceptance, Sustainability, Success Factor, Technology Acceptance Model, Expectancy Confirmation model.

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INTRODUCTION

The revolution of digital transformation in the education field (such as the introduction of LMS, MOOCs, etc. platforms) at all levels has allowed to adopting a newly teaching-learning ecosystem called eLearning. Without any doubt, the Web and all of its ancillaries have opened up previously unimaginable possibilities and opportunities (Lee and Jeon (2020)). Thus, an eLearning ecosystem contains an educator and apprentice group, substance and component (text, audiovisual), principles and techniques (adaptive, effective), systems and procedures (internet, multimedia, semantic web), and managing of learning properties (obtain, elicit, unify, recover, reuse) (Atukunda, P et. Al (2024)).

eLearning is more than transferring traditional lecture materials. The eLearning trend in India has been on the rise for the last decades, with cost-effectiveness and learning flexibility being key factors. Success depends on content quality, representation, and infrastructural support. A standard set of quality parameters could reduce variation and improve overall eLearning quality. Professionals believe identifying these parameters is essential for improving eLearning outcomes in India. Incorporating these parameters can address uncertainties, provide an integrated approach, address information security, and ensure compliance with statutory, legal, and regulatory requirements (Bhattacharya, S., & Das, P. (2020)). However, maintaining improved results requires integration with regular practices and a quality framework. India is embracing online learning, with structured, proper eLearning frameworks. However, concerns about e-learning effectiveness proposed by Roy, S. et. al. (2020). Chahal, J., and Rani, N. (2022) explores the factors influencing e-learning adoption among Indian higher education apprentices, focusing on COVID-19's impact on instructional methods. It uses the Technology Acceptance Model to analyse perceived ease of use, usefulness, behavioural intention, and attitude. The findings suggest that institutions should improve training programs, develop intuitive interfaces, and promote e-learning awareness. A thematic review by Chelawat, A., and Sant, S. (2023) discusses how eLearning can accelerate education for sustainable development in Indian higher education. This study emphasizes the integration of sustainability concepts into the curriculum and teaching methods, creating a foundation for education that is both impactful and durable. Additionally, it identifies infrastructure challenges and the necessity for robust government support to maintain digital platforms in rural and semi-urban areas. The research underscores the need for policies that support digital literacy and training to ensure that educational institutions and students can fully leverage eLearning for sustainable growth.

Principles and methods are a significant part of pedagogical approaches in teaching and learning methods. Popular strategies include active, explorative, adaptive, collaborative, blended, and concept mapping. However, without appropriate supporting technologies, these instructional techniques are limited in their effectiveness in an eLearning system. Studies have shown the usefulness of these principles in eLearning (Dicheva and Dichev, 2006; Alonso et al., 2005).

Research on the sustainability of eLearning emphasizes the effectiveness of systems and processes in adopting pedagogical strategies. Technologies like adaptive, blended, active, concept mapping, information retrieval, and computer-supported collaborative studying are proposed for enriching the eLearning environment. Effective resource management is crucial for expanding sustainable eLearning (Keramati et al. (2011)). The management of substance involves addressing learner benefits from pedagogical strategies and associates. It involves systematic activities like forming, capturing, validating, recovering, and reusing eLearning contents. Corbitt et al. (2010) found authentication ontology and learner profile. Selim, H. M. (2007) surveyed CSF.

The Expectation-Confirmation Model is commonly used by researchers for evaluating the adoption of technologies. Sumi, R.S. (2024) introduced an integrated model to measure students' intention to continue using eLearning services, utilizing ECM constructs like confirmation, ease of use, perceived usefulness, and self-efficacy to evaluate satisfaction. This study explores the effect of quality traits on satisfaction and persistence intention, service quality, including information efficiency and system quality. The PLS-SEM findings show that the PEOU has a significant impact on the PU, after the perceived self-efficacy. The study highlights the unique challenges faced by learners in developing countries and the need for widespread research regarding holistic growth in the education market of Bangladesh. System quality significantly influences satisfaction, but service and information quality have negligible influence. The study suggests that proper attention to the development of content and continuous up-gradation can enhance the level of involvement and satisfaction among e-learners. Prasetya et. al, (2022) explored the adoption of eLearning system and its correlation with service quality, system quality, performance expectancy, and satisfaction. The hypothesis indicates that there exists a positive correlation between satisfaction and CI, and that confirmation is also correlated with satisfaction. Chow, W.S., and Shi, S. (2014) explored the satisfaction and purpose to continue using eLearning among students by applying the Expectation-Confirmation Model. The study expanded four (learning procedure, collaboration with peers, communication with tutor, and curriculum design) quality assurance factors to quantify post-adoption expectation in eLearning. Results showed confirmation positively influences PAE factors and satisfaction, with learning procedure and course layout significantly influencing satisfaction and continuance intention. The study suggests that eLearning practitioners should enhance students' confirmation of expectations and PAE.

After reviewing the comprehensive literature, the study identified many variables that affect the effectiveness of eLearning, which were grouped in three success factors as: 1) User Satisfaction 2) Service Quality and 3) Benefits. Each Success Factor is explained in previous research papers as follows:

User satisfaction

User satisfaction was described by Almarashdeh (2016) as the accuracy of the information obtained through an eLearning system. User satisfaction is crucial for eLearning system performance, affecting user experience, functionality, utility benefits, and information quality. It depends on perceived self-efficiency and learning environment and can be improved by improving skills. Successful systems incorporate learners' collaborative interests and consider service quality and infrastructure dependability. Research has been conducted to determine these factors.

Service quality

Learning involves inputs, transformation, and outputs. Service quality in eLearning systems influences learner satisfaction. Quality is measured by functionality and technicality. User engagement and prior expectations impact service evaluation. Proper explanations and support improve service delivery. Service quality is the ability in eLearning

to provide services to users with suitable navigation features, organized content, and a dependable and responsive system.

Learner-friendly systems are likely to outperform competitors due to their focus on differentiating service products and enhancing learner satisfaction (Wang et al., 2007). The benefits of providing safety in education through eLearning have been analysed, and three dimensions have been identified to assess the level of User Satisfaction, that is, cost reduction, time reduction, and performance improvement (Ho and Dzung, 2010).

Net benefits

Net benefits could be defined as the degree to which knowledge and skills gained by the learner and proper implementation of that acquired knowledge. Ferguson and DeFelice (2010) analysed that net benefit is a vital factor to the success of an eLearning system. DeLone and McLean (2003) define net benefits as the impact of management and individual users on achieving their goals in an eLearning environment. These benefits can include improved test results and better employability. Kettinger and Smith (2009) and Isaac et al. (2017) measure net benefits to learners, focusing on academic performance, satisfaction, personal growth, and career progression.

In the proposed model, a combination of three constructs – satisfaction of the user, net benefits, and service quality will be measured for the overall effectiveness of the eLearning system. Sustainability is described as continuing innovation processes which benefit society, economy, and environment (Foo, 2013). Technological, organizational, and societal reforms are necessary for sustainable development (Sahid et al., 2011). Sustainable eLearning refers to Learner's satisfaction of the pedagogical system, service quality of infrastructure, and benefits of the system's impact.

Technology Acceptance Model (TAM)

One of the most recognized techniques for assessing users' acceptability of innovations is the Technology Acceptance Model, which has been extensively used in many research. The TAM identifies four variables affecting the adoption of new technologies: perceived utility, ease of use, attitude towards use, and net benefits of behavioural purpose. It suggests that external variables can influence users' perceptions of ease of use and usefulness. However, not all TAM indicators predict sustainability. Recent changes focus on enhancing net benefits for user happiness and system reusability, as success only considers positive effects (Binyamin et al., 2017). Many studies have examined the usage and acquiescence of technology in education. Davis et al. introduced a TAM in 1989, predicting ICT acceptance using PU and PEOU. The model considers perceived usefulness and ease of use, with the Need for Cognition (NFC) being a moderated variable.

Expectation Confirmation Model (ECM)

The Expectation Confirmation Model represents a theory that enlightens how users' expectations and their confirmation of those expectations shape their continued

use of a product or service. The ECM is based on the idea that satisfaction is achieved when expectations are confirmed. The ECM was constructed based on the ECT hypothesis by Oliver (2001), which evaluates people's desire to repurchase and behavior by inspecting the relationships among expectation, usefulness, confirmation, satisfaction, and repurchase intention. Alshammari et. al. (2024) studied repurchase intention and behavior in virtual classrooms by analyzing the relationships among expectation, satisfaction, usefulness, confirmation, and intention to repurchase. It suggests that intention to use virtual classrooms could be like repurchasing behavior in ECT, with perceived usefulness, confirmation, satisfaction, and continuous intention being key factors.

RESEARCH GAP

Existing studies focus on short-term adoption factors or success indicators, neglecting the intersection of user situational acceptance and long-term sustainability. The integration of TAM and ECM models is underexplored in Indian educational frameworks, where challenges like digital literacy and varying pedagogical needs significantly impact perceived ease of use and usefulness. A conceptual model tailored to Indian learners is needed, integrating TAM's adoption factors with ECM's focus on user satisfaction and continuance intention. This hybrid approach could predict the sustainable success of eLearning systems in India and help adapt educational technology to better serve diverse learner populations.

RESEARCH OBJECTIVE

The objective of this study is to expand the theoretical understanding of the variables affecting eLearning effectiveness, the method in which these variables have been studied to date, and to suggest an appropriate conceptual model of eLearning effectiveness to assist its assessment.

Design of the Study

The paper reconsiders and critically reviews most important contributions to the eLearning effectiveness literature.

Discussion and conceptual model

The aim of this research is to improve understanding of the Technology Acceptance Model (TAM) for evaluating eLearning adoption and factors influencing it. It provides an extended TAM model for assessing sustainability, derived from 60 papers published between 2010 and 2024. The model is improved to account for eLearning adoption in emerging countries like India, including external factors like learner happiness and service quality.

The Expectation Confirmation Model (ECM) is a tool used to analyse how students' expectations about online learning experiences align with their actual experiences. It involves pre-course expectations (Expectations Formation, Influencing Factors), perceived performance (Experience Evaluation- Content Quality, Platform Usability, Instructor

Interaction, Engagement), and post-course evaluation (Confirmation or Disconfirmation). Aligning expectations can enhance satisfaction, engagement, and learning outcomes. To apply ECM in eLearning, course design, UX design, instructor interaction, feedback mechanisms, and expectation management should be implemented. This approach helps educational institutions better understand and meet students' needs, leading to improved satisfaction and learning outcomes.

Another reason for this article was to better explore the parameter or variable associated with the construct of the parameter's success factor of influencing eLearning effectiveness. And to propose a hybrid conceptual model of eLearning using extended TAM and ECM models for measuring sustainability. The research study reveals that eLearning success is influenced by various factors, and different studies may have different classifications of success elements. Here, eLearning success factors has been categorized into three dimensions. These are learner's satisfaction, service quality, and benefit. The summary of the variables is presented in Table 2, 3, and 4.

Stakeholders and perceived beneficiaries of an eLearning system are learners or students. Learners are recognizing the benefits of using eLearning platforms, but proper usage is crucial as education awareness increases and students become more engaged and advanced.

This paper introduced a theoretical framework for evaluating the sustainability of an eLearning ecosystem, considering three elements: Pedagogical/Learning Perspective, Technological and Other Infrastructure Perspective, and Management Perspective. The framework considers learner satisfaction, service quality, and benefits to measure its effectiveness. Our vision is to measure a sustainable eLearning system to ensure quality education in the future. The support of learner satisfaction and overall benefits is one of sustainable e-traits.

In this hybrid model, TAM could be used to understand initial adoption behaviour, while ECM could focus on continued use and sustainability. Here's how these might be integrated the eLearning system's initial adoption is affected by perceived usefulness and ease of use, which in turn affects satisfaction and continued use intention. Sustainability factors like system quality, content quality, and user training are also considered.

When focusing on students in an eLearning environment, the external variables that influence Perceived Usefulness (PU) and Perceived Ease of Use (PEOU) are tailored to their educational needs and experiences. These factors can greatly impact how students perceive the effectiveness and accessibility of an eLearning platform. For students, these external variables directly affect their willingness to adopt and continue using eLearning platforms. For instance, PU apprentices are more likely to find the platform useful if it directly contributes to their academic success through relevant content, interactive learning tools, and personalized learning paths. PEOU a platform that is easy to navigate, accessible

on multiple devices, and supported by clear instructions and tutorials will be perceived as easier to use, encouraging sustained engagement.

The optimisation of these factors enables eLearning systems to more effectively cater to the requirements of students, resulting in increased satisfaction, enhanced learning results, and higher rates of adoption.

The framework (Fig 1) provides a deeper understanding of the eLearning ecosystem. Here, we are focusing on a learner-centered eLearning environment that incorporates user perception and behavioral intention as critical factors in achieving the net benefits of eLearning. Here variables (e.g., Service Quality and Benefits) are intermediaries that influence both Perceived Usefulness and Perceived Ease of use, and they are connected, which measures the sustainability of the system. This framework incorporates user perception and behavioral intention as critical factors in achieving the net benefits of eLearning.

To carry out the research, a structured questionnaire will be created for the collection of data. The study will be conducted in select colleges and universities in eastern India using a structured questionnaire to capture students' perceptions of technology-mediated teaching throughout the COVID-19 period. The first version of the questionnaire shall be circulated to the limited participants who had prior experience with eLearning. Those collected data from the pilot study will be used to test the reliability and validity of the questionnaire. The final questionnaire will then be sent to students at higher education institutes who have undertaken an eLearning course at the time of COVID-19 and post-pandemic era.

THEORITICAL FRAMEWORK

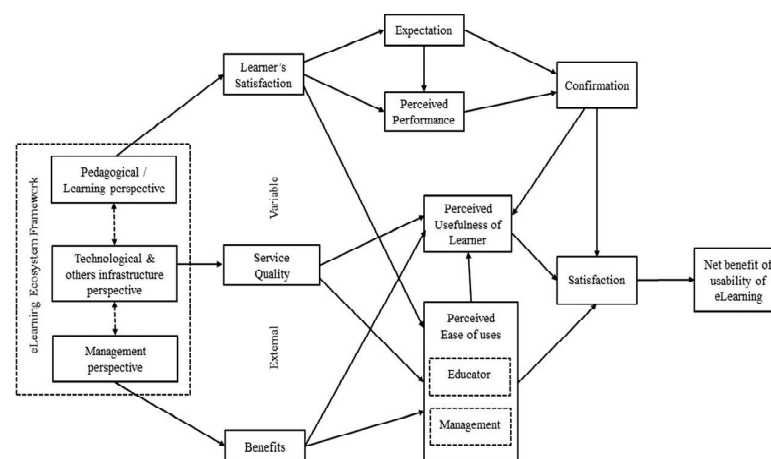
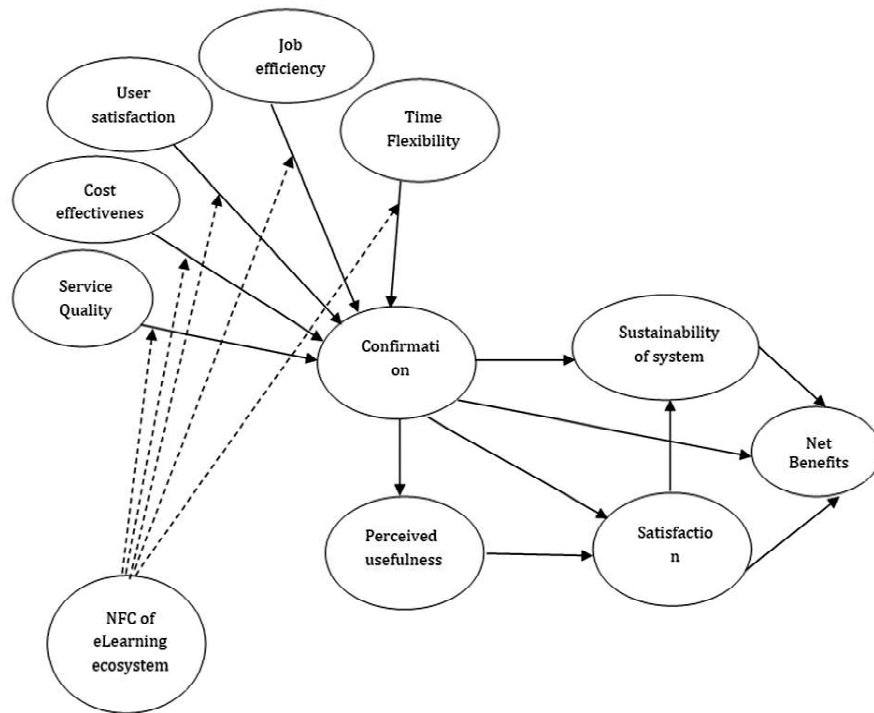


Fig 1: Conceptualized Hybrid Model using TAM and ECM for measuring sustainability of eLearning

Table 1: Identifying Constructs

Constructs List	Reference
Confirmation	Bhattacharjee, (2001)
Continuance Usage Intention	Al-amin et al. (2022)
Satisfaction	DeLone and McLean (2003), Lee et al. (2009)
Perceived Ease of use (PEOU)	DeLone and McLean (2003), Wang and Liao (2008)
Perceived Usefulness (PU)	DeLone and McLean (2003), Hassanzadeh et al. (2012)
Perceived Performance	Hsu et al. (2018), Luo and Du (2022)
Service Quality	Wang and Liao (2008), Au et al. (2008)
System Quality	DeLone and McLean (2003)
Net benefit	Isaac et al. (2017), El-Gohary (2012)

**Fig 2: Conceptualized acceptance model for measuring sustainability of eLearning**

In Fig 2, the Necessary Factors and Conditions (NFC) of the eLearning Ecosystem drives quality aspects like User Satisfaction, Cost-Effectiveness, and Service Quality, which together influence Confirmation. Confirmation then impacts the system's Perceived Usefulness, Sustainability, and Satisfaction, leading to Net Benefits. This flow shows how a well-designed eLearning ecosystem can lead to positive outcomes, as long as key factors align with user expectations and provide functional advantages like efficiency and flexibility.

This section summarized external variables of the success factors that affect the effectiveness of eLearning in following table from previous studies.

Table 2: Variables of User satisfaction

Authors	Variables
Duggal (2022)	Learner's collaboration interests
Shuja et al. (2019)	Infrastructure dependability
Kang et al. (2018)	Satisfaction, helpfulness, Reference to others, overall contentment
Pham and Huynh (2017)	computer self-efficacy, frontal communication, email interaction, simplicity of use and social occurrence
Almarashdeh (2016)	System functionality, information accurateness, significance of quality service
Ramayah and Lee (2012)	Quality of Service, quality of system, quality of information
Reynolds (2012)	Learner's readiness
Teo (2011)	Delivery of the course, instructor attributes, learning atmosphere, favourable circumstances

Table 3: Variables measured in Quality of Service

Authors	Variables
Uppal et al. (2017)	Content of learning, empathy, responsiveness, tangibility assurance, reliability
Raspopovic et al. (2014)	Stimuli interest factor, accessibility, assessment grade for facilitators assumed by learner, promptness, usefulness, demonstrated knowledge, receiving response from facilitators

Kritikos et al. (2013)	Significance of service performance, significance of quality information, significance of quality experience,
Benlian et al. (2011)	Completion, system accessibility, security, flexibility, efficiency, confidentiality

Table 4: Variables of Benefits

Authors	Variables
Isaac et al. (2017)	Efficiency at work, possession of knowledge, communication skills, ability to make decisions
Gay (2016)	Empowerment, saving time, improvement of skills, academic excellence
Raspopovic et al. (2014)	Time saving, learning enhancement, achievements, knowledge and idea acquisition in academic
Oye et al. (2012)	Academic excellence
El-Gohary (2012)	Cost-Effectiveness

CONCLUSION

In this article, we have reconsidered significant instances of the eLearning effectiveness research literature. According to our critical analysis and synthesis of the literature, a conceptual model has been proposed to evaluate the sustainability of the eLearning ecosystem in India. It identifies constructs and items for eLearning adoption, focusing on learner perception and accrued benefits. The study emphasizes the need to prioritize success factors affecting eLearning system effectiveness to improve overall outcomes and ensure learning continuity and national lifelong learning programs. It is nevertheless anticipated that such a conceptual model will assist comprehension of the significant variables affecting eLearning efficacy and the way in which they interact.

FUTURE SCOPE OF THE STUDY

The proposed model under this work is a part of the research, in the next stage the proposed model will be validated using different methods including expert opinion and survey questionnaires. Future study should therefore seek to deploy the model in an experimental context to evaluate its provenance and it is the intention of the current authors to do so.

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