

Impact of E-Learning Success Factors on Academic Performance: The Role of Gender among Management Undergraduates in a Sri Lankan State University

D. M. T. D. Dissanayake¹ and A. G. M. A. Kumari²

Department of Business Management, Faculty of Business Studies and Finance

Wayamba University of Sri Lanka

¹tanyad@wyb.ac.lk, ²achalak@wyb.ac.lk

Abstract: E-learning has become a transformative force in higher education, mainly in developing countries such as Sri Lanka, where technology-mediated learning has gained rapid momentum. The increasing reliance on platforms like Zoom, Google Meet, and Microsoft Teams highlights the importance of understanding how success factors shape academic outcomes. The present study investigates the impact of e-learning success factors perceived ease of use, perceived usefulness, self-efficacy, and interaction on student performance among management undergraduates at Sri Lankan State University, while examining the role of gender. Primary data were collected through a structured questionnaire from 309 undergraduates selected using a convenience sampling method. A quantitative, deductive research design was applied, and data were analyzed using SPSS software. The findings revealed that perceived usefulness and self-efficacy had a significant positive impact on student performance, while perceived ease of use and interaction showed weaker or context-dependent effects. Gender was not found to significantly moderate the relationship between e-learning success factors and academic performance. This suggests that the effects of e-learning success factors on student performance are generally similar across male and female students. These results provide valuable insights for policymakers, educators, and technology developers in designing inclusive and effective e-learning environments. The study emphasizes the need to address contextual barriers such as accessibility, digital literacy, and psychological effects to ensure that e-learning fulfills its potential in improving academic performance.

Keywords: *E-learning, Student Performance, Perceived Usefulness, Self-Efficacy, Gender, Sri Lanka*

Introduction

Every aspect of life human beings is changed because of the rapid growth of information and communication technology. However, this influence on Information and Communication Technology (ICT) may be more strongly affected the educational aspect than other aspects of life. The improvements of ICT transfer education from physical classroom to virtual classroom through new technologies related to computer and internet (Kanaganayagam, 2013). This new educational platform, e-learning can be defined as technology-based learning in which learning materials are delivered

electronically to remote learners via a computer network (Lee, Lee, & Kim, 2018). In another perspective “E-learning is the use of electronic devices and Internet technologies to deliver a variety of solutions to enable learning and improve performance” (Ghirardini, 2021).

E-learning has significantly transformed educational experiences by transcending geographical barriers, reducing delivery costs, and reaching diverse learners including working professionals and mobility-constrained individuals worldwide (Ghirardini, 2021). Its inherent flexibility enables self-paced, just-in-time learning, eliminating the temporal and

spatial constraints of conventional education (Ally, 2004). Beyond accessibility, e-learning cultivates cognitive skills encompassing knowledge comprehension and problem-solving, alongside interpersonal skills including active listening and negotiation, through interactive and collaborative online methodologies (Ghirardini, 2021). The growing adoption of video conferencing platforms including Zoom, Google Meet, and Microsoft Teams further reflects the expanding significance of digital communication in higher education. While Google Meet offers multiplatform voice, video, and screen-sharing capabilities (Google, 2020), Microsoft Teams integrates comprehensive educational features including assignment distribution and grading within the Microsoft 365 ecosystem (Microsoft, 2020), collectively necessitating systematic evaluation of their effectiveness across diverse learning environments.

According to the Kirkpatrick Model (Kirkpatrick, 2006), the evaluation of e-learning includes learners' reactions, learning outcomes, behavior, and results. Learners' reactions refer to their satisfaction, participation, and overall experience in the learning process. Student performance and satisfaction are widely recognized as key indicators of e-learning effectiveness (Alavi, Wheeler, & Valacich, 1995; Graham & Scarborough, 2001). Higher levels of satisfaction are positively associated with improved academic performance and learning outcomes (Rodriguez, Molina, Alonso, & Gomez, 2015). Therefore, academic performance is considered a critical factor in designing effective e-learning systems and maintaining institutional competitiveness (Poturak, 2014).

However, in the modern digital context, the effectiveness of e-learning is influenced by technological challenges associated with platforms such as Zoom,

Google Meet, and Microsoft Teams. Issues such as time limitations, accessibility barriers, system complexity, and technical requirements can negatively affect user experience, participation, and overall performance (Zoom Video Communications, 2020; Google, 2020; TechRepublic, 2021). These limitations are particularly significant in developing countries, where infrastructure and digital access constraints may hinder the success of e-learning environments. Security and privacy represent critical concerns surrounding video conferencing platforms. Notably, Zoom experienced widespread Zoombombing cyberattacks during the COVID-19 pandemic, undermining public trust in platform security (FBI Public Service Announcement, 2020). Furthermore, data protection concerns have intensified as platforms collect substantial volumes of user data, often without users' full awareness (Electronic Frontier Foundation, 2020). These issues highlight the pressing need for transparent privacy safeguards to maintain user trust and combat cybersecurity threats.

Beyond security, extended video conferencing use poses significant psychological consequences. Bailenson (2021) identifies "Zoom fatigue" as a condition characterized by mental exhaustion resulting from prolonged eye contact, continuous self-viewing, and restricted physical movement during video calls. This phenomenon has been widely reported among students, educators, and remote workers globally. Additionally, dependence on stable internet connectivity exacerbates existing inequalities, particularly among rural and economically disadvantaged users, contributing to reduced participation and performance (World Bank, 2021).

The growing use of video conferencing platforms such as Zoom, Google Meet, and Microsoft Teams highlights the need to examine their impact on user

experience, accessibility, security, and psychological well-being. While prior studies emphasize their advantages (Dhawan, 2020), issues like digital exclusion, cyber threats, and user stress remain underexplored (World Bank, 2021; Bailenson, 2021). This study addresses these gaps by providing a balanced understanding of both benefits and challenges, offering insights for improving platform design, policy, and user well-being.

Objectives of the Study

The primary research objective of the study is to examine the impact of success factors of e-learning on student performance among Management undergraduates in Sri Lankan State University with moderating impact of gender.

Based on research problem following objectives are identified as secondary research objectives.

- i. To examine the impact of Perceived Ease of Use on Student Performance in e-learning environments.
- ii. To examine the impact of Perceived Usefulness on Student Performance in e-learning environments.
- iii. To examine the impact of Interaction on Student Performance in e-learning environments.
- iv. To examine the impact of Self-Efficacy on Student Performance in e-learning environments.
- v. To examine the role of gender on the relationship between e-learning success factors and student performance.

Significance of the Research

Despite the rapid proliferation of video conferencing platforms, existing literature remains largely focused on technological

features and benefits, inadequately addressing digital exclusion, cybersecurity risks, and psychological strain among diverse user groups (Dhawan, 2020; World Bank, 2021; Bailenson, 2021). This study addresses these gaps by systematically examining the impact of such platforms on user engagement, mental well-being, data security, and accessibility. The findings are intended to inform technology developers, policymakers, and institutions in designing more inclusive, secure, and user-centred solutions, while contributing theoretically to digital communication, educational technology, and cybersecurity scholarship (OECD, 2021).

Literature Review

Key theories that can measure DV; Academic Performance

A robust measurement of academic performance in e-learning research requires theoretical grounding that captures cognitive outcomes, learner behaviors, and socio-pedagogical mechanisms. The Technology Acceptance Model (TAM), Self-Efficacy and Self-Regulated Learning (SRL) theories and the Community of Inquiry (COI) framework, each contribute complementary perspectives for defining and operationalizing academic performance in online settings.

Technology Acceptance Model (TAM)

PEOU and PU as antecedents of use and performance. The TAM posits that perceived ease of use (PEOU) and perceived usefulness (PU) predict behavioral intention and actual use of information systems (Davis, 1989). In e-learning research, TAM is useful not only for explaining adoption but also for linking platform perceptions to downstream performance: when students rate a system as easy and useful they are more likely to use it consistently, and consistent, purposeful use often translates

into better learning outcomes (Venkatesh & Davis, 2000; Lee, Lee, & Kim, 2018). Thus, TAM supports measuring academic performance together with behavioral use metrics (login frequency, time-on-task) to capture the mediating effect of actual system use on grades.

Self-Efficacy and Self-Regulated Learning (SRL)

Learner capability as a pathway to performance. Bandura's concept of self-efficacy (belief in one's capability to perform tasks) and later SRL models emphasize that students' confidence and regulatory strategies (planning, monitoring, help-seeking) strongly influence whether technology use becomes effective learning (Bandura, 1997; Zimmerman, 2000). Empirical studies show online learning self-efficacy (OLSE) predicts persistence, strategy use, and better assessment results in e-learning contexts (Schunk & DiBenedetto, 2020). From a measurement perspective, OLSE and SRL scales (self-report) and behavioral proxies (timely submissions, use of supplemental resources) offer mediating indicators that explain how platform use converts into academic performance.

Community of Inquiry (COI)

Interaction quality and pedagogical presence. The COI framework (teaching, social, and cognitive presences) explicates how instructional design and interaction quality foster deeper learning in online environments (Garrison, Anderson, & Archer, 2000). COI is particularly valuable for measuring the interaction dimension of e-learning because it moves beyond frequency counts to conceptualize quality of interaction (e.g., level of cognitive discourse, instructor facilitation, social presence). COI survey scales and discourse analysis methods therefore provide theoretically grounded measures that relate interaction quality to academic

outcomes such as higher-order assignment marks and course grades (Arbaugh, 2014).

Theoretical Gaps

Although numerous theories such as the Technology Acceptance Model (TAM) (Davis, 1989), Self-Efficacy Theory (Bandura, 1997), Self-Regulated Learning (SRL) Models (Zimmerman, 2000), and the Community of Inquiry (COI) Framework (Garrison, Anderson, & Archer, 2000) have been used to explain e-learning adoption and outcomes, there remain clear theoretical gaps in the existing literature. Most studies treat these frameworks in isolation rather than as an integrated model that links technology perceptions, learner capabilities, and interaction to academic performance. For example, while TAM successfully explains adoption through perceived ease of use (PEOU) and perceived usefulness (PU), it does not capture how these perceptions translate into self-regulation, motivation, and actual learning outcomes (Al-Fraihat et al., 2020). Similarly, SRL and self-efficacy theories emphasize learner confidence and regulation but often neglect the technological dimensions of e-learning environments (Schunk & DiBenedetto, 2020).

A significant theoretical gap concerns interaction quality, as empirical studies predominantly reduce engagement to frequency measures rather than examining the depth of interaction conducive to improved academic outcomes (Moore, 2013; Arbaugh, 2014). Furthermore, prevailing theoretical frameworks remain largely grounded in developed-country contexts, constraining their applicability in developing settings such as Sri Lanka, where infrastructural limitations and uneven institutional readiness significantly mediate e-learning effectiveness (Dhawan, 2020; Perera & Rathnayake, 2021). The moderating role of gender similarly remains under-theorized; although differential

technology perceptions between male and female learners have been documented (Venkatesh & Morris, 2000; Ong & Lai, 2006), existing models insufficiently account for underlying determinants including access disparities and sociocultural expectations. Moreover, the absence of longitudinal integrative frameworks linking short-term engagement with sustained academic achievement constitutes a critical theoretical limitation, as cross-sectional designs predominate the existing literature (Ifenthaler & Yau, 2020).

E-learning, conceptualized as technology-mediated instruction delivered through electronic networks (Clark & Mayer, 2016), has fundamentally transformed higher education by fostering flexible, accessible, and cost-effective learning environments encompassing both synchronous and asynchronous modalities (Abed, 2019; Valverde-Berrocso, 2020). Despite enhancing learner engagement and critical thinking (Chithra & Raj, 2018), persistent challenges including technological barriers and insufficient self-regulatory skills constrain its effectiveness (Ghirardini, 2021), rendering systematic evaluation imperative through frameworks such as the Kirkpatrick Model (2006).

This study examines four key e-learning success factors: Perceived Ease of Use (PEOU), referring to system usability; Perceived Usefulness (PU), reflecting performance enhancement; Self-Efficacy (SE), denoting learners' platform confidence; and Interaction (I), encompassing student-student, student-teacher, and student-content engagement (Davis, 1989; Bandura, 1997; Moore, 2013). Academic performance, the dependent variable, is measured through grades, GPA, and skill development, further influenced by engagement and digital adaptability (York et al., 2015; Martin et al., 2017). Gender is considered a moderating variable, as male and female

students demonstrate differential perceptions and engagement with e-learning technologies (Venkatesh & Morris, 2000; Ong & Lai, 2006), while contextual factors including infrastructure limitations and digital literacy further mediate e-learning effectiveness within the Sri Lankan higher education context (Perera & Rathnayake, 2021).

Therefore, this study aims to examine the impact of e-learning success factors (PEOU, PU, SE, and Interaction) on academic performance, with the role of gender, providing a comprehensive understanding of e-learning effectiveness in higher education.

Academic performance is widely recognized as a key indicator of student success, reflecting both individual learning outcomes and the overall quality of education systems (York, Gibson, & Rankin, 2015). It plays a vital role in shaping students' personal development, employability, and long-term career opportunities (Robbins et al., 2019). At the institutional level, academic performance is used to evaluate teaching effectiveness, curriculum quality, and institutional competitiveness (Tinto, 2012). In the context of e-learning, academic performance has gained increased importance, as digital platforms such as Zoom, Google Meet, and Microsoft Teams have transformed traditional learning environments. While e-learning enhances flexibility, interaction, and accessibility, challenges such as digital inequality, self-regulation issues, and technological barriers can influence student outcomes (Dhawan, 2020; Bailenson, 2021).

Academic performance is a multidimensional construct measured through both quantitative indicators such as GPA and grades, and qualitative aspects such as critical thinking, engagement, and problem-solving skills (Harackiewicz et al., 2016). In e-learning

environments, performance is further influenced by students' ability to adapt to digital platforms and actively participate in online learning activities (Martin, Sunley, & Turner, 2017). Recent advancements such as learning analytics provide additional measures of performance, including engagement, participation, and online behavior (Siemens & Long, 2011; Ifenthaler & Yau, 2020).

Literature on relationship explained E-Learning Toward Academic Performance

The relationship between academic performance and e-learning has been widely studied in the context of higher education, especially since the global shift to online learning during the covid-19 pandemic. According to Almaiah et al. (2022), e-learning can achieve results as good as or even superior to those for face-to-face learning, provided that courses are well structured and well supported. However, as Dhawan (2020) notes, e-learning is not inherently effective but rather under the premise of being system usability-dependent, instructor-dependent, and technology infrastructure provision-dependent.

A significant amount of literature determines the effects of perceived ease of use (PEOU) and perceived usefulness (PU) on academic performance. As per the Technology Acceptance Model, Davis (1989) originally claimed that technology adoption would be led by learners' perceptions of ease and usefulness. Subsequent research, such as that conducted by Lee, Lee, and Kim (2018), supports that students with the ability to utilize platforms in an easy way and perceive them as useful for learning are more active and perform better. Similarly, Al-Fraihat et al. (2020) remark that PU has high potential to predict success and satisfaction in online learning systems, while PEOU facilitates usage again and

again of the platform, thus contributing towards enhanced performance.

Self-efficacy has also emerged as an important variable linking e-learning to academic achievement. Bandura (1997) formulated self-efficacy as belief in being capable of accomplishing tasks, and this has been used in online learning contexts. Zimmerman (2000) demonstrated how students with higher academic self-efficacy self-regulate, persevere in adversity, and yield more resilient results. Likewise, Schunk and DiBenedetto (2020) proved that learning self-efficacy in virtual settings encourages students' persistence and strategy use, which directly improve their academic achievement.

Student-teacher, student-student, and student-content interaction is also a mechanism with close associations with academic performance. Interaction was regarded by Moore (2013) as among the fundamental determinants of effective online learning. Further, Ghirardini (2021) argues that online collaborative activities, feedback, and role-playing result in greater learning and better performance outcomes. Arbaugh (2014) also discovered that students engaged in high-quality online interaction exhibited superior cognitive learning and course performance compared to poor interaction students.

Beyond cognitive developments, performance in e-learning requires broader indicators. Siemens and Long (2011) suggest that learning analytics such as logging frequency and task duration achieve early measures of total grades. Ifenthaler and Yau (2020) further demonstrate that analytics-based measures of engagement possess extremely strong correlations to student success, hence being worthwhile for monitoring and directing performance. Besides, concurrently, Rodriguez, Molina, Alonso, and Gomez (2015) argue that

student satisfaction and perceived learning would also be valuable as indirect measures of performance because they are a measure of learners' embrace of digital platforms.

Context significantly shapes e-learning effectiveness, particularly in developing countries where infrastructural limitations including restricted device access, unstable connectivity, and limited digital literacy constrain learning potential (Perera & Rathnayake, 2021; World Bank, 2021). Gender further moderates the e-learning performance relationship, with female learners prioritizing ease of use and interaction while males demonstrate greater technological confidence yet inconsistent participation (Venkatesh & Morris, 2000; Ong & Lai, 2006). Collectively, platform functionalities including usability, usefulness, and interactivity shape student attitudes and self-efficacy, subsequently influencing academic performance, though environmental variables such as gender and infrastructure significantly mediate these relationships (Al-Fraihat et al., 2020; Dhawan, 2020). Accordingly, this study investigates the impact of perceived ease of use, perceived usefulness, self-efficacy, and interaction on academic performance among management undergraduates' Sri Lankan State University, with gender as a moderating variable.

Empirical Gaps

Although research on e-learning has expanded, several empirical gaps remain. Most studies are cross-sectional, limiting causal insights; for example, Al-Fraihat et al. (2020) and Ifenthaler and Yau (2020) found links between system quality and performance but admitted that long-term effects were not examined. Few intervention studies exist, and those that do such as Schunk and DiBenedetto (2020) are mainly from Western contexts, leaving limited evidence in South Asia.

Measurement is also inconsistent: some rely on self-reports (Rodriguez et al., 2015), others on analytics (Siemens & Long, 2011), while Perera and Rathnayake (2021) noted that Sri Lankan studies often fail to align perceptions with actual grades. Contextual issues like poor infrastructure are often ignored, despite Dhawan (2020) showing they strongly influence outcomes. Moreover, interaction quality is simplified to frequency counts, overlooking the deeper cognitive engagement highlighted by Garrison et al. (2000) and Arbaugh (2014). Finally, the role of gender as a moderator is underexplored; while Venkatesh and Morris (2000) and Ong and Lai (2006) reported gender differences in technology use, Sri Lankan studies such as Perera and Rathnayake (2021) rarely test these effects formally.

There are four variables to measure IV.:

1. Perceived Ease of Use

Although Perceived Ease of Use (PEOU) has been widely studied in the Technology Acceptance Model (TAM), several empirical gaps remain in its application to e-learning and academic performance. Many studies confirm that PEOU significantly influences learners' intention to adopt online platforms (Venkatesh & Davis, 2000; Lee, Lee, & Kim, 2018), but fewer examine whether this perception directly improves academic outcomes such as grades or GPA. For instance, Al-Fraihat et al. (2020) showed that PEOU enhanced student satisfaction, yet they did not test its effect on actual performance. Similarly, Almaiah et al. (2022) highlighted that ease of use increased system adoption during COVID-19, but the link between adoption and learning achievement was underexplored. Another gap lies in context-specific evidence. Most empirical studies on PEOU are from developed countries with advanced infrastructure, while research in developing contexts like Sri Lanka is

limited. Perera and Rathnayake (2021) found that although undergraduates appreciated the simplicity of platforms like Zoom and Google Meet, unstable internet and device limitations often weakened the benefits of PEOU. This suggests that contextual moderators such as infrastructure and access may dilute the expected positive impact of PEOU on performance, yet these factors are rarely modeled. Finally, the role of gender differences in PEOU remains empirically unclear. While Venkatesh and Morris (2000) reported that female students are more sensitive to system usability, studies in South Asian contexts have not thoroughly examined whether gender moderates the PEOU performance relationship. This leaves a gap in understanding how PEOU contributes to academic success across diverse learner groups.

2. Perceived Usefulness

Perceived Usefulness (PU) is one of the strongest predictors of technology acceptance, yet its direct relationship with academic performance remains underexplored. Davis (1989) originally defined PU as the degree to which using a system enhances learning or productivity, and subsequent studies (Venkatesh & Davis, 2000; Lee, Lee, & Kim, 2018) confirmed that PU strongly influences intention to use e-learning platforms. However, most of this work emphasizes adoption and satisfaction rather than objective academic outcomes. For example, Al-Fraihat et al. (2020) reported that PU predicted satisfaction in online courses but did not assess whether it improved exam scores or GPA. Similarly, Almaiah et al. (2022) found that learners who perceived platforms as useful were more engaged, yet the link between usefulness and measurable performance was left untested. Another empirical gap is the lack of evidence from developing contexts. Research in Western universities consistently supports PU as a predictor of

engagement, but in South Asian contexts the relationship is less clear due to infrastructure and resource barriers. Perera and Rathnayake (2021) observed that Sri Lankan undergraduates recognized the usefulness of Zoom and MS Teams for continuing education during the pandemic, but this did not always translate into higher academic achievement because of poor internet connectivity and limited access to devices. This suggests that PU's impact on performance may be moderated by contextual challenges, yet few studies formally test these conditions. Finally, the role of gender in shaping PU's influence has not been sufficiently addressed. Ong and Lai (2006) found that male students tended to prioritize usefulness more than females, while Venkatesh and Morris (2000) reported that both genders differed in how PU influenced their technology adoption. However, there is little empirical testing of whether gender moderates the PU academic performance pathway in Sri Lankan higher education, leaving this relationship underexplored.

3. Self-Efficacy

Self-efficacy students' belief in their ability to successfully perform academic tasks has been widely studied as a determinant of learning outcomes (Bandura, 1997; Zimmerman, 2000). In online education, research consistently shows that higher online learning self-efficacy (OLSE) improves motivation, persistence, and self-regulated learning strategies (Schunk & DiBenedetto, 2020). For instance, Alqurashi (2016) reported that OLSE significantly predicted satisfaction and engagement in e-learning environments. However, most studies emphasize attitudinal and behavioral outcomes rather than direct academic performance indicators such as grades or GPA. Ifenthaler and Yau (2020) noted that while OLSE is often assumed to enhance achievement, empirical evidence directly connecting confidence to objective

academic results is still limited. Another gap relates to cultural and contextual variations. Much of the evidence on self-efficacy comes from Western higher education systems. In South Asia, studies such as Perera and Rathnayake (2021) found that Sri Lankan undergraduates lacked confidence in managing digital platforms, which reduced their engagement, but the research did not test whether this actually lowered academic performance. This suggests that in developing contexts, OLSE may play a different role because infrastructure limitations, lack of training, and limited prior exposure can constrain its influence on outcomes. Furthermore, the role of gender in shaping self-efficacy outcomes remains empirically underexplored. While Bong and Skaalvik (2003) highlighted that female students often report lower self-efficacy in technology-related contexts, other studies (Ong & Lai, 2006) suggested that gender effects are context-specific and mediated by prior digital experience. In Sri Lankan universities, empirical testing of gender as a moderator in the SE–performance link is almost absent, despite evidence that socio-cultural factors may amplify gender differences in confidence and engagement.

4. Interaction

Interaction including student–teacher, student–student, and student–content engagement is a cornerstone of effective online learning (Moore, 2013). Prior research consistently shows that quality interaction fosters motivation, engagement, and satisfaction, which in turn support better learning outcomes (Garrison, Anderson, & Archer, 2000; Arbaugh, 2014). For example, Martin, Sun, and Westine (2020) found that timely instructor feedback and collaborative activities significantly improved perceived learning in online courses. However, many empirical studies focus mainly on satisfaction and engagement, while fewer directly link interaction to

measurable academic performance such as grades or GPA. Another gap arises from the over-simplification of interaction measurement. As noted by Garrison et al. (2000), the quality of interaction (cognitive depth, social presence, and teaching presence) is more important than the frequency of logins or posts. Yet, in much of the literature, interaction is measured using basic counts of discussion entries or attendance logs (Alqurashi, 2019), which fail to capture the richness of engagement. This reduces the ability of studies to explain how interaction actually drives academic performance. Contextual limitations further widen the gap. In developed settings, robust findings show that interactive e-learning supports better achievement (Arbaugh, 2014; Martin et al., 2020). But in developing countries, where interaction is often constrained by connectivity, limited training, and resource shortages, the evidence is weaker. Perera and Rathnayake (2021) reported that Sri Lankan undergraduates valued interactive features of Zoom and MS Teams, but poor internet connections frequently interrupted these interactions, limiting their impact on learning outcomes. Few empirical studies in Sri Lanka have systematically tested whether interaction quality predicts actual academic performance. Finally, the moderating role of gender in interaction is underexplored. Ong and Lai (2006) found that female students often place greater importance on collaboration and instructor presence, while male students may rely more on independent learning. Yet, in South Asian higher education, very few empirical studies have examined whether gender differences in interaction translate into different academic outcomes.

5. Academic Performance

Although academic performance is a widely used outcome in e-learning research, several empirical gaps remain in how it is defined and measured. Many studies still rely on self-reported measures

of performance, such as perceived learning or satisfaction, rather than objective outcomes. For example, Alqurashi (2019) reported that online learning self-efficacy and interaction strongly predicted students perceived learning, but did not use official grades or GPA to validate these claims. Similarly, Al-Fraihat et al. (2020) linked system quality to satisfaction but did not assess whether such satisfaction improved actual academic results. This overreliance on self-reports raises concerns about the validity of findings. Another gap lies in the inconsistent use of indicators. Some studies use course grades (Rodriguez et al., 2015), others focus on engagement analytics such as logins or time-on-task (Siemens & Long, 2011), while very few triangulate these with standardized performance metrics. Ifenthaler and Yau (2020) argue that combining learning analytics with official performance data provides stronger evidence, yet many studies neglect this integrated approach. Contextual differences also widen the gap. In developed settings, digital learning platforms are strongly linked with positive performance outcomes (Martin, Sun, & Westine, 2020). However, in developing contexts, infrastructure barriers complicate this relationship. Perera and Rathnayake (2021) observed that Sri Lankan undergraduates continued their studies through e-learning during the pandemic but often struggled with connectivity and resource limitations, which negatively impacted their performance. Despite these findings, systematic empirical testing of e-learning's effect on academic achievement in Sri Lankan higher education remains scarce. Finally, most research treats academic performance as a short-term, course-level outcome, while ignoring long-term indicators such as semester GPA, retention, or graduation rates. As Dhawan (2020) highlighted, the pandemic accelerated digital learning, but studies have yet to demonstrate whether

these platforms contribute to sustained academic success.

6. Gender

Although gender has been examined in technology adoption research, its role as a moderator in the relationship between e-learning success factors and academic performance remains underexplored. Venkatesh and Morris (2000) showed that male students often emphasize perceived usefulness (PU) when adopting new systems, whereas female students are more influenced by perceived ease of use (PEOU). Similarly, Ong and Lai (2006) reported that women value collaboration and instructor interaction more than men. However, most of these studies focus on technology adoption and satisfaction rather than academic outcomes such as grades or GPA. Recent e-learning research also presents mixed findings. For instance, Alqurashi (2019) found that gender differences in satisfaction and interaction were minimal when controlling for prior experience, while Martin, Sun, and Westine (2020) suggested that female learners benefited more from structured instructor presence. These inconsistencies indicate that gender effects may be context-specific and mediated by cultural or infrastructural factors. In the South Asian context, research is limited. Perera and Rathnayake (2021) observed that Sri Lankan female undergraduates often displayed strong commitment to online learning but faced access barriers, while males tended to report higher confidence with technology use. However, their study did not formally test gender as a moderating variable between e-learning success factors (PEOU, PU, self-efficacy, interaction) and academic performance. This highlights a clear empirical gap in understanding how gender influences these relationships in resource-constrained higher education environments.

Conceptualization of Research Model

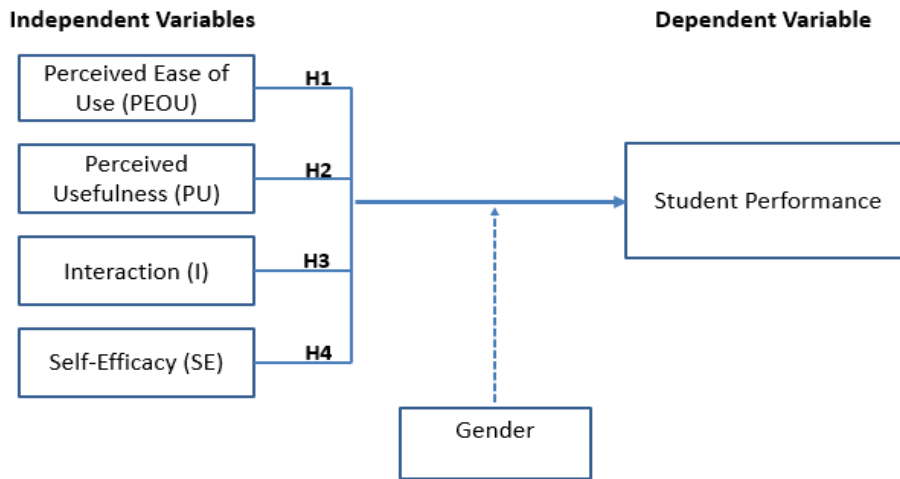


Figure 1: Conceptual Framework

Source: Developed by Author, 2026

Methodology

This study employs a quantitative cross-sectional survey design to examine the impact of e-learning success factors on academic performance among management undergraduates at Sri Lankan State University, with gender as a moderating variable. Grounded in a positivist philosophy and deductive approach, the study draws on established theoretical frameworks including the Technology Acceptance Model (TAM) and Self-Efficacy Theory to facilitate hypothesis testing through empirical data (Sekaran, 2021). A structured questionnaire served as the primary data collection instrument, ensuring reliability and consistency in measurement.

The questionnaire was developed by adapting validated scales from established literature. Items measuring Perceived Ease of Use, Perceived Usefulness, and Self-Efficacy were adapted from Tarhini, Hone, and Lin (2014), which built upon the original TAM scales of Davis (1989). Interaction items were adapted from Kuo et al. (2014) and Barnard et al. (2009). To

ensure contextual relevance for Sri Lankan undergraduates, the original items were reviewed by two subject matter experts in educational technology and modified for linguistic clarity and cultural appropriateness. A five-point Likert scale (1 = Strongly Disagree to 5 = Strongly Agree) was employed for all constructs except gender, which was measured as a binary categorical variable. A pilot test was conducted with 30 students outside the final sample to assess item clarity, and minor wording adjustments were made based on pilot feedback before the main data collection.

Population, Sample, and Sampling Technique

The target population comprised approximately 2,322 management undergraduates enrolled across four academic years at the Faculty of Business Studies and Finance, Sri Lankan State University, selected due to their direct engagement with e-learning platforms. Using the Krejcie and Morgan (1970) sampling table, a sample of 331 students was determined to ensure

representativeness; however, following the exclusion of incomplete responses and outliers, 309 questionnaires were deemed usable for final statistical analysis. A convenience sampling technique was employed. Data were collected via an

online questionnaire distributed through Google Forms, with participants invited through email and social media and assured of confidentiality and anonymity throughout the process.

Table 1: Operationalization of Variable

Variable	Dimension	Indicators	Measurement	Source
E-Learning Success Factors (IV)	Perceived Ease of Use	• Easy to navigate • Simple to use • User-friendly interface	Likert's scale	(Tarhini, Hone, & Lin, 2014)
	Perceived Usefulness	• Improves learning • Increases productivity • Enhances results	Likert's scale	(Tarhini, Hone, & Lin, 2014)
	Interaction	• Student-instructor interaction • Peer collaboration • Student-Platform Engagement	Likert's scale	Kuo et al. (2014), Barnard et al. (2009)
	Self-Efficacy	• Confidence in using e-learning • Ability to complete tasks • Problem-solving with e-learning tools	Likert's scale	(Tarhini, Hone, & Lin, 2014)
Student Performance (DV)		• Grades • Assignment quality • Learning outcomes • Time management • Perceived academic improvement via e-learning	Likert's scale / GPA	Ooms, A., & Montanez, M. (2008)
Gender (Moderating Variable)		• Male / Female	Categorical (nominal)	Al-Azawei, A. (2019)

Source: Author, 2026

Data Analysis

Collected data were analyzed using both descriptive and inferential statistical techniques via IBM SPSS software. Descriptive statistics summarized respondent demographics and key variables, while inferential analysis

comprising correlation and regression analysis examined relationships between e-learning success factors and academic performance. The findings provide empirical insights into the determinants of students' academic performance within the e-learning environment at Sri Lankan State University.

Demographic Profile

Table 2: Sample Profile Summary

Demographic Category	Subcategory	Percentage	Frequency (n = 309)
Academic Year	Level 1	25%	77
	Level 2	25%	77
	Level 3	25%	77
	Level 4	25%	78
Age	Below 22 Years	40%	124
	22 to 25 Years	45%	139
	Above 25 Years	15%	46
Gender	Male	40%	124
	Female	60%	185
GPA (Most Recent Semester)	Below 2.50	20%	62
	2.50 – 3.00	35%	108
	3.01 – 3.50	30%	93
	Above 3.50	15%	46

Note, N= 309

Source: Researcher Constructed based on Survey Data, 2026

Reliability and Validity

Reliability of the study variables was assessed using Cronbach's Alpha. It measures internal consistency with values

ranging from 0 to 1. A value of 0.7 or above is considered acceptable (Leung, 2015). The results in Table 3 show that all variables exceeded the threshold value, indicating that the measurement scales are reliable and consistent.

Table 03: Reliability Statistics

Cronbach's Alpha	N of Items
.938	4

Source: Analysis Results, 2026

Table 04: Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
PU	12.4889	3.693	.862	.916
In	12.6442	3.605	.844	.923
SE	12.5072	3.883	.849	.920
AP	12.5804	3.998	.867	.916

Resource: Result of SPSS Software

Thus, as per previous studies regarding Cronbach's alpha, all the variables, including Perceived Ease of Use, Perceived Usefulness, Interaction, Self-Efficacy and student performance are

reliable enough to use for analysis purposes. Since Cronbach's alpha for these variables is above 0.7, many articles suggest that Cronbach's alpha greater than 0.6 is also considered reliable.

Regression Analysis

Table 05: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.883 ^a	.779	.776	.30120
a. Predictors: (Constant), SE, PEOU, In, PU				
b. Dependent Variable: AP				

Resource: Result of SPSS Software

The model summary presents an R value of 0.883, indicating a strong positive correlation between the independent variables and the dependent variable. The R Square value of 0.779 shows that 77.9% of the variation in academic performance (dependent variable) is explained by the combined effect of perceived ease of use, perceived usefulness, interaction, and self-

efficacy (independent variables). The remaining 22.1% of the variation is explained by other factors not included in the model. The Adjusted R Square value of 0.776 confirms the goodness of fit of the model after adjusting for the number of predictors. Overall, the results indicate that the regression model has a strong explanatory power.

Table 06: ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	97.124	4	24.281	267.651	.000 ^b
	Residual	27.579	304	.091		
	Total	124.702	308			
a. Dependent Variable: AP						
b. Predictors: (Constant), SE, PEOU, In, PU						

Resource: Result of SPSS Software

Table 06 which shows the regression model significance, the entire model is statistically significant as regression results depicts that significance value is 0.000 which is less than 0.05.

Table 07: Coefficient

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.462	.119		3.872	.000
	PEOU	.246	.044	.247	5.591	.000
	PU	.313	.044	.356	7.056	.000
	In	.205	.041	.244	4.995	.000
	SE	.119	.049	.126	2.429	.016

a. Dependent Variable: AP

Source: Result of SPSS Software

As per table 07, the Perceived Ease of Use, Perceived Usefulness, Interaction, and Self-Efficacy variable has positive regression coefficients of 0.246, 0.313, 0.205, and 0.119 respectively and the significance values are less than 0.05 threshold limit. This proves that Perceived Ease of Use, Perceived Usefulness, Interaction, and Self-Efficacy have a positive and significant impact on the dependent variable, student performance. Hence, a one-unit increase in Perceived Ease of Use, Perceived Usefulness, Interaction, and Self-Efficacy is associated with an increase of 0.246, 0.313, 0.205, and 0.119 units respectively in student performance, while holding other variables constant. Thus, in this study, all the first, second, third and fourth alternative hypotheses developed regarding each independent variable can be accepted while the null hypothesis is rejected.

Prior to conducting the moderation analysis using PROCESS Macro in SPSS, a composite variable titled E-Learning Success Factors (ELSF) was created by computing the mean scores of the four independent variables: Perceived Ease of Use (PEOU), Perceived Usefulness (PU), Interaction (IN), and Self-Efficacy (SE).

The composite score was calculated to represent the overall level of e-learning success factors perceived by students. Mean values were used instead of summed scores to maintain consistency with the original five-point Likert scale measurement. The generated ELSF variable was then used as the independent variable in the moderation analysis, with gender treated as the moderating variable and academic performance as the dependent variable.

Analysis of Moderation Effect of Gender

Table 08: Process Matrix for Moderating Effect [Process I]

Predictor	Coefficient (β)	SE	t-value	p-value	95% LLCI	95% ULCI	Interpretation
Constant	4.163	0.018	228.434	0.000	4.127	4.199	Significant
E-Learning Success Factors (ELSF)	0.830	0.027	30.277	0.000	0.776	0.884	Significant positive effect
Gender	-0.005	0.037	-0.142	0.887	-0.078	0.068	Not significant
ELSF × Gender	-0.067	0.055	-1.212	0.226	-0.176	0.042	Moderation not significant

Source: Analysis Results, 2026

Model Summary

Statistic	Value
Sample Size (N)	309
R	0.868
R ²	0.753
MSE	0.101
F-value	310.296
df1	3
df2	305
Model Significance (p)	0.000

Source: Analysis Results, 2026

Test of Interaction Effect

Interaction Term	ΔR^2	F-value	df1	df2	p-value	Result
ELSF $\times$ Gender	0.0012	1.470	1	305	0.226	Not Significant

Source: Analysis Results, 2026

Decision on Moderation Hypothesis

Hypothesis	Decision
H5: Gender significantly moderates the relationship between E-Learning Success Factors and Academic Performance	Rejected

Source: Analysis Results, 2026

As per table 08, R square of e-learning success factors, the independent variable, and moderator variable is 0.8679, explaining 86.79% variations of the dependent variable, student performance. Even though coefficient is positive 0.0012, the significance value for moderator analysis is 0.2263, which

demonstrates that the moderator effect is insignificant. Hence the significance value is not less than 0.05. Hence, the findings further reveal that gender does not significantly moderate the relationship between e-learning success factors and academic performance among management undergraduates.

Table 09: Hypotheses Testing

Hypotheses	Correlation coefficient	P value	Regression coefficient	P value	Accept/reject
There is a significant impact of Perceived Ease of Use on student performance in e-learning environments.	0.776	0.000	0.246	0.000	Accept
There is a significant impact of Perceived Usefulness on student performance in e-learning environments.	0.827	0.000	0.313	0.000	Accept
There is a significant impact of Interaction on student performance in e-learning environments.	0.797	0.000	0.205	0.000	Accept

Hypotheses	Correlation coefficient	P value	Regression coefficient	P value	Accept/reject
There is a significant impact of Self-Efficacy on student performance in e-learning environments.	0.786	0.000	0.119	0.016	Accept
Gender significantly moderates the relationship between e-learning success factors and student performance.	-	-	0.0012	0.2263	Reject

Source: Author, 2026

Findings and Discussions

The results show that the four e-learning success factors self-efficacy, perceived usefulness, perceived ease of use, and interaction are essential for improving student performance. The interdependence of the variables emphasizes the need for a comprehensive strategy: the best learning outcomes are promoted by a system that is user-friendly, worthwhile, participatory, and confidence-boosting. These findings highlight how important it is to incorporate interactive elements, learner support techniques, and user-focused design concepts into e-learning platforms. The moderation analysis revealed that gender does not significantly influence the relationship between e-learning success factors and academic performance. This indicates that the benefits of e-learning success factors are experienced similarly by both male and female students in the study context.

Perceived Ease of Use

According to the study's findings, there is a substantial correlation ($r = 0.776$, $p < 0.001$) and regression effect between perceived ease of use and student performance in e-learning environments. Accordingly, students are more likely to interact with e-learning platforms successfully and perform better academically when they are clear, easy to use, and navigable. Therefore, there is a

significant impact of Perceived Ease of Use on student performance in e-learning environments.

Although Perceived Ease of Use (PEOU) has been widely studied in the Technology Acceptance Model (TAM). Many studies by Venkatesh and Davis (2000), Lee et al. (2018) confirmed that PEOU significantly influences learners' intention to adopt online platforms. Al-Fraihat et al. (2020) showed that PEOU enhanced student satisfaction. Similarly, Almaiah et al. (2022) highlighted the link between adoption and learning achievement was underexplored. Accordingly, past literature Perera and Rathnayake (2021), Venkatesh and Morris (2000), Venkatesh and Davis (2000), Lee et al. (2018), Al-Fraihat et al. (2020), Almaiah et al. (2022) also align with the finding of this study that there is a significant impact of Perceived Ease of Use on student performance.

Perceived Usefulness

The greatest predictor of student performance was perceived usefulness ($r = 0.827$, $p < 0.001$), suggesting that students are more driven and effective when they believe that e-learning platforms are useful resources for accomplishing learning goals. Therefore, there is a significant impact of Perceived Usefulness on student performance in e-learning environments. Perceived usefulness emerged as the strongest

predictor of academic performance among management undergraduates. This finding suggests that students are more likely to engage with e-learning platforms when they perceive them as valuable tools for improving learning outcomes, accessing course materials, and completing academic tasks. In the Sri Lankan context, where e-learning became essential for educational continuity, students who recognized the practical benefits of online learning platforms demonstrated higher levels of academic performance. This finding is consistent with the Technology Acceptance Model (Davis, 1989), which emphasizes perceived usefulness as a key determinant of technology adoption and effective utilization.

Perceived Usefulness (PU) is one of the strongest predictors of technology acceptance model. Venkatesh & Davis (2000) and Lee et al. (2018) confirmed that PU strongly influences intention to use e-learning platforms. Al-Fraihat et al. (2020) reported that PU predicted satisfaction in online courses. Similarly, Almaiah et al. (2022) found that learners who perceived platforms as useful were more engaged. Perera and Rathnayake (2021) observed that Sri Lankan undergraduates recognized the usefulness of Zoom and MS Teams for continuing education during the pandemic. This suggests that PU's impact on performance may be moderated by contextual challenges, yet few studies formally test these conditions. Accordingly, past literature Venkatesh & Davis (2000), Lee et al. (2018), Al-Fraihat et al. (2020), Almaiah et al. (2022), Perera and Rathnayake (2021), Ong and Lai (2006), Venkatesh and Morris (2000) also align with the finding of this study that there is a significant impact of Perceived Usefulness on student performance.

Interaction

Student performance is considerably impacted by interaction ($r = 0.797$, $p <$

0.001). The significance of peer-to-peer contact and student-teacher involvement in online learning environments is highlighted by this research. Therefore, there is a significant impact of Interaction on student performance in e-learning environments.

Prior research consistently shows that quality interaction fosters motivation, engagement, and satisfaction, which in turn support better learning outcomes (Garrison, Anderson, & Archer, 2000; Arbaugh, 2014). Martin et al. (2020) found that timely instructor feedback and collaborative activities significantly improved perceived learning in online courses. As noted by Garrison et al. (2000), the quality of interaction is more important than the frequency of logins or posts. Perera and Rathnayake (2021) reported that Sri Lankan undergraduates valued interactive features of Zoom and MS Teams, but poor internet connections frequently interrupted these interactions, limiting their impact on learning outcomes.

Accordingly, past literature also aligns with the finding of this study that there is a significant impact of Interaction on student performance (Moore, 2013), (Arbaugh, 2014), (Martin et al., 2020), (Ong & Lai, 2006), (Garrison et al., 2000), (Arbaugh, 2014), (Martin et al., 2020), (Garrison et al., 2000), (Perera & Rathnayake, 2021).

Self-Efficacy

A positive relationship between self-efficacy and student performance was identified ($r = 0.786$, $p < 0.001$) suggesting that learners' confidence in their capacity to finish assignments successfully influences online learning outcomes. Therefore, there is a significant impact of Self-Efficacy on student performance in e-learning environments. Self-efficacy also showed a significant positive impact on academic performance. This indicates that students who possess greater confidence

in their ability to use e-learning technologies are better able to manage online learning activities and overcome technological challenges. In the Sri Lankan higher education context, where students may face issues such as limited digital experience and connectivity constraints, confidence in using e-learning systems becomes particularly important for achieving academic success. This finding supports Bandura's (1997) self-efficacy theory and previous studies which identified learner confidence as an important determinant of successful online learning outcomes.

The higher online learning self-efficacy (OLSE) improves motivation, persistence, and self-regulated learning strategies (Schunk & DiBenedetto, 2020). Alqurashi (2016) reported that OLSE significantly predicted satisfaction and engagement in e-learning environments. Ifenthaler and Yau (2020) noted that while OLSE is often assumed to enhance achievement. In South Asia, studies such as Perera and Rathnayake (2021) found that Sri Lankan undergraduates lacked confidence in managing digital platforms, which reduced their engagement. While Bong and Skaalvik (2003) highlighted that female students often report lower self-efficacy in technology-related contexts, other studies (Ong & Lai, 2006) suggested that gender effects are context-specific and mediated by prior digital experience. Accordingly, past literature also aligns with the finding of this study that there is a significant impact of Self-Efficacy on student performance (Bandura, 1997), (Zimmerman, 2000), (Schunk & DiBenedetto, 2020), (Alqurashi, 2016), (Ifenthaler & Yau, 2020), (Perera & Rathnayake, 2021), (Skaalvik, 2003), (Ong & Lai, 2006).

Gender as a Moderator

E-learning success characteristics had a consistent effect on student performance for both male and female learners,

according to the analysis, which did not support the moderating effect of gender, as significance value of the process matrix run for moderator analysis is greater than 0.05. Therefore, Gender significantly does not moderate the relationship between e-learning success factors and student performance.

Implications of the study

The findings carry significant implications for higher education policy and practice, particularly within Sri Lankan State University undergraduate e-learning program. The identified success factors including self-efficacy, perceived usefulness, ease of use, and interaction underscore the necessity of designing supportive, interactive, and user-friendly e-learning environments to enhance academic performance. Educators and administrators should prioritize system usability, active engagement, and learner confidence as practical measures for improving student outcomes.

For curriculum developers and instructional designers, the findings provide a framework for integrating interactive elements and fostering self-efficacy in online course design, while also guiding the evaluation and refinement of future e-learning initiatives. At the institutional level, universities should invest in technology infrastructure, staff and student training, and inclusive access policies to ensure equitable learning opportunities. Notably, as gender was not a significant moderator, policies may focus on establishing consistent standards of online education applicable across all student demographics.

Conclusion

This study examined the impact of e-learning success factors Perceived Ease of Use, Perceived Usefulness, Self-Efficacy, and Interaction on the academic performance of management undergraduates at Sri Lankan State

University, with gender as a moderating variable. The findings indicate that key factors such as perceived usefulness and self-efficacy play a significant role in enhancing student performance, while other factors show varying levels of influence depending on context.

The results further reveal that gender does not significantly moderate the relationship between e-learning success factors and academic performance. Therefore, the positive effects of perceived ease of use, perceived usefulness, interaction, and self-

efficacy on academic performance are generally consistent across both male and female students. Overall, the study highlights that effective implementation of e-learning systems, supported by user-friendly platforms, strong learner confidence, and meaningful interaction, can significantly improve academic performance. These findings provide valuable insights for educators and policymakers to design more effective and inclusive e-learning environments in higher education.

References

- Abed, E. K. (2019). Electronic learning and its benefits in education. *International Journal of Educational Research*, 7(2), 45–52.
- Alavi, M., Wheeler, B. C., & Valacich, J. S. (1995). Using IT to reengineer business education: An exploratory investigation of collaborative telelearning. *MIS Quarterly*, 19(3), 293–312. <https://doi.org/10.2307/249597>
- Al-Azawei, A. (2019). What drives or impedes the acceptance of e-learning? An investigation in Iraqi higher educational context. *IEEE Access*, 7, 46384–46395. <https://doi.org/10.1109/ACCESS.2019.2909331>
- Al-Fraihat, D., Joy, M., Masa'deh, R., & Sinclair, J. (2020). Evaluating e-learning systems success: An empirical study. *Computers in Human Behavior*, 102, 67–86. <https://doi.org/10.1016/j.chb.2019.08.004>
- Almaiah, M. A., Al-Khasawneh, A., & Althunibat, A. (2020). Exploring factors influencing the use of e-learning systems during COVID-19 pandemic. *Education and Information Technologies*, 25, 5261–5280. <https://doi.org/10.1007/s10639-020-10219-y>
- Almaiah, M. A., Alfaisal, R., Salloum, S. A., Al-Otaibi, S., Shishakly, R., Lutfi, A., & Alrawad, M. (2022). Do we trust the robots? Examining the factors affecting the use of e-learning systems during COVID-19 pandemic. *Sustainability*, 14(23), 1–22. <https://doi.org/10.3390/su142315823>
- Alqurashi, E. (2016). Self-efficacy in online learning environments: A literature review. *Contemporary Issues in Education Research*, 9(1), 45–52.
- Alqurashi, E. (2019). Predicting student satisfaction and perceived learning within online learning environments. *Distance Education*, 40(1), 133–148.
- Arbaugh, J. B. (2014). System, scholar, or students? Which most influences online MBA course effectiveness? *Journal of Computer Assisted Learning*, 30(4), 349–362. <https://doi.org/10.1111/jcal.12048>

- Bailenson, J. N. (2021). Nonverbal overload: A theoretical argument for causes of Zoom fatigue. *Technology, Mind, and Behavior*, 2(1).
<https://doi.org/10.1037/tmb0000030>
- Bandura, A. (1997). *Self-efficacy: The exercise of control*. W. H. Freeman.
- Barnard, L., Lan, W. Y., To, Y. M., Paton, V. O., & Lai, S. L. (2009). Measuring self-regulation in online and blended learning environments. *Internet and Higher Education*, 12(1), 1–6.
- Bong, M., & Skaalvik, E. M. (2003). Academic self-concept and self-efficacy: How different are they really? *Educational Psychology Review*, 15(1), 1–40.
- Bryman, A. (2016). *Social research methods* (5th ed.). Oxford University Press.
- Chithra, V., & Raj, M. A. (2018). E-learning benefits and challenges in education. *Journal of Education and Practice*, 9(12), 45–49.
- Clark, R. C., & Mayer, R. E. (2016). *E-learning and the science of instruction* (4th ed.). Wiley.
- Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly*, 13(3), 319–340.
<https://doi.org/10.2307/249008>
- Dhawan, S. (2020). Online learning: A panacea in the time of COVID-19 crisis. *Journal of Educational Technology Systems*, 49(1), 5–22.
- Durndell, A., & Haag, Z. (2002). Computer self-efficacy, computer anxiety, attitudes towards the internet and reported experience with the internet, by gender, in an East European sample. *Computers in Human Behavior*, 18(5), 521–535.
- Electronic Frontier Foundation. (2020). *Privacy concerns in video conferencing platforms*.
<https://www EFF.org>
- Federal Bureau of Investigation. (2020). *Zoom-bombing public service announcement*.
<https://www.fbi.gov>
- Garrison, D. R., Anderson, T., & Archer, W. (2000). Critical inquiry in a text-based environment: Computer conferencing in higher education. *The Internet and Higher Education*, 2(2–3), 87–105.
- Gefen, D., & Straub, D. (1997). Gender differences in the perception and use of e-mail: An extension to the technology acceptance model. *MIS Quarterly*, 21(4), 389–400.
- Ghirardini, B. (2021). *E-learning methodologies: A guide for designing and developing e-learning courses*. Food and Agriculture Organization of the United Nations.
- Google. (2020). *Google Meet features and specifications*. <https://meet.google.com>
- Graham, M., & Scarborough, H. (2001). Enhancing the learning environment for distance learners. *Distance Education*, 22(2), 232–244.
- Harackiewicz, J. M., Barron, K. E., Pintrich, P. R., Elliot, A. J., & Thrash, T. M. (2016). Revision of achievement goal theory: Necessary and illuminating. *Journal of Educational Psychology*, 98(3), 597–610.

- Ifenthaler, D., & Yau, J. Y. K. (2020). Utilising learning analytics to support study success in higher education: A systematic review. *Educational Technology Research and Development*, 68, 215–230.
- Kanaganayagam, K. (2013). Impact of ICT on education. *Sri Lankan Journal of Education*, 2(1), 15–22.
- Kirkpatrick, D. L. (2006). *Evaluating training programs: The four levels*. Berrett-Koehler.
- Krejcie, R. V., & Morgan, D. W. (1970). Determining sample size for research activities. *Educational and Psychological Measurement*, 30(3), 607–610.
- Kuo, Y.-C., Walker, A. E., Belland, B. R., & Schroder, K. E. E. (2014). A predictive study of student satisfaction in online education programs. *International Review of Research in Open and Distributed Learning*, 14(1), 16–39.
- Lee, J., Lee, H., & Kim, Y. (2018). Factors influencing e-learning adoption in higher education: The role of support, self-efficacy, and technology acceptance. *Computers & Education*, 120, 75–89.
- Lee, M. K. O. (2006). E-learning: Are there differences in learning styles across cultures? *Journal of Educational Technology & Society*, 9(2), 187–197.
- Leung, S. O. (2015). A comparison of psychometric properties and normality in 4-, 5-, 6-, and 11-point Likert scales. *Journal of Social Service Research*, 41(4), 45–50.
- Martin, F., Sunley, R., & Turner, L. (2017). Engagement in online learning: Student attitudes and behavior. *Online Learning*, 21(3), 1–15.
- Martin, F., Sun, T., & Westine, C. D. (2020). A systematic review of research on online teaching and learning from 2009 to 2018. *Computers & Education*, 159, 104045.
- Microsoft. (2020). *Microsoft Teams features and specifications*. <https://www.microsoft.com/en-us/microsoft-teams>
- Moore, M. G. (Ed.). (2013). *Handbook of distance education* (3rd ed.). Routledge.
- Ong, C.-S., & Lai, J.-Y. (2006). Gender differences in perceptions and relationships among dominants of e-learning acceptance. *Computers in Human Behavior*, 22(5), 816–829.
- Ooms, A., & Montanez, M. (2008). Measuring student performance in higher education. *Assessment & Evaluation in Higher Education*, 33(6), 1–12.
- Organisation for Economic Co-operation and Development. (2021). *Education at a glance 2021: OECD indicators*. OECD Publishing. <https://doi.org/10.1787/b35a14e5-en>
- Perera, K., & Rathnayake, R. M. (2021). E-learning challenges in Sri Lankan universities during COVID-19. *Sri Lankan Journal of Management*, 26(1), 45–60.
- Poturak, M. (2014). Private universities and competitive advantage. *European Journal of Education*, 49(2), 123–135.

- Robbins, S. B., Lauver, K., Le, H., Davis, D., Langley, R., & Carlstrom, A. (2004). Do psychosocial and study skill factors predict college outcomes? A meta-analysis. *Psychological Bulletin*, 130(2), 261–288. <https://doi.org/10.1037/0033-2909.130.2.261>
- Rodriguez, M. C., Molina, J. M., Alonso, J. M., & Gomez, F. (2015). Learning satisfaction and performance in e-learning environments: Effect of the training design and individual characteristics of the students. *Computers in Human Behavior*, 47, 28–35.
- Schunk, D. H., & DiBenedetto, M. K. (2020). Motivation and social cognitive theory. *Contemporary Educational Psychology*, 60, 101832.
- Sekaran, U., & Bougie, R. (2016). *Research methods for business: A skill-building approach* (7th ed.). Wiley.
- Siemens, G., & Long, P. (2011). Penetrating the fog: Analytics in learning and education. *EDUCAUSE Review*, 46(5), 30–40.
- Tarhini, A., Hone, K., & Liu, X. (2014). The effects of individual-level characteristics on students' behavioural intention to use web-based learning technologies in Lebanon. *Computers in Human Behavior*, 31, 169–178.
- TechRepublic. (2021). *Microsoft Teams usability issues*. <https://www.techrepublic.com>
- Terry, N., & Gomez, R. (2011). Gender differences in information and communication technology use among students. *Journal of Educational Technology*, 7(2), 25–30.
- Ting, C. Y. (2021). Gender and digital learning behavior: Exploring differences in online academic engagement. *Education and Information Technologies*, 26, 123–140.
- Tinto, V. (2012). *Completing college: Rethinking institutional action*. University of Chicago Press.
- United Nations Educational, Scientific and Cultural Organization. (2020). *Gender disparities in digital learning*. UNESCO. <https://www.unesco.org>
- Valverde-Berrocoso, J., Garrido-Arroyo, M. D. C., Burgos-Videla, C., & Morales-Cevallos, M. B. (2020). Trends in educational research about e-learning: A systematic literature review (2009–2018). *Sustainability*, 12(12), 5153.
- Venkatesh, V., & Davis, F. D. (2000). A theoretical extension of the technology acceptance model: Four longitudinal field studies. *Management Science*, 46(2), 186–204.
- Venkatesh, V., & Morris, M. G. (2000). Why men use computers: Gender differences in technology use. *MIS Quarterly*, 24(1), 115–139. <https://doi.org/10.2307/3250981>
- Voyer, D., & Voyer, S. D. (2014). Gender differences in scholastic achievement: A meta-analysis. *Psychological Bulletin*, 140(4), 1174–1204.
- World Bank. (2021). *The digital divide and education: Bridging the gap*. World Bank Group. <https://www.worldbank.org>
- York, T. T., Gibson, C., & Rankin, S. (2015). Defining and measuring academic success. *Practical Assessment, Research & Evaluation*, 20(5), 1–20.

- Zhang, D. (2006). Delivering personalized instruction online: Interaction design of an adaptive learning environment. *Information Technology, Learning, and Performance Journal*, 24(2), 1–14.
- Zimmerman, B. J. (2000). Self-efficacy: An essential motive to learn. *Contemporary Educational Psychology*, 25(1), 82–91.
- Zoom Video Communications. (2020). *Zoom features and specifications*. <https://zoom.us>