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Enhancing E-Learning Performance through the Integration of UTAUT, TTF and SET Models: A Conceptual Paper

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Abstract

E-learning has become an essential tool in today's world, offering flexibility and accessibility to learners across the globe. However, the effectiveness of the system is often challenged by factors such as inadequate infrastructure, poor internet connection and underutilization of resources. These issues have led to insufficient e-learning assessment and incomprehensive research models for evaluating e-learning performance. The objective of this study is to propose a new framework that integrates the unified theory of acceptance and use of the technology (UTAUT), task-technology fit (TTF), and self-efficacy theory (SET) to enhance e-learning performance. By synthesizing these models, this study intends to provide an all-encompassing framework to understand the determinants of e-learning performance and offer practical insights for enhancing learner adoption and effectiveness. The proposed framework is not only contributing to the developments of new theoretical knowledge in the literature by identifying key determinants factors but also offers fresh perspectives for practitioners and policymaker. It aims to enhance the execute educational process in the post-COVID19 era and help to design more effective e-learning systems moving forward.

Keywords: E-Learning Performance, SET, TTF, UTAUT

Introduction

Nowadays, e-learning has emerged as a vital approach to modern education, enabling learners to access the information's at anytime and anywhere (Hasim et al., 2023; Hasim et al., 2024). This transformation has been driven by advancement of digital technologies and the growing demand for new perspective of learning styles of the 21st century, flexibility and cost-effective learning solutions over the world (Rafiq et al., 2024). Harnessing digital technologies, e-learning has made education system more accessible and effective for diverse spectrum of learners. The purpose of this transformation is to overcome the traditional boundaries of classroom settings by offering the evolving needs and preferences of leaners in a rapidly changing world such as massive open online courses (MOOCs) which aims to promote accessibility to education, encourage lifelong learning, provide flexibility in learning

and fostering inclusivity in education to a wider audience across the globe (Zakaria et al., 2024). Previously, e-learning platforms were primarily used as device or tools for enhancing teaching and learning in the educational institutes (Ansari & Khan, 2020). E-learning provides leaners with the flexibility to access, revisit and engage educational contents at their own convenience. In addition, technological tools and e-learning platforms can boost learner interaction through asynchronous and synchronous, including email, chats, forums and video conferences (Adnan & Anwar, 2020; Fabriz et al., 2021). Furthermore, internet can make it possible to distribute content to a large number of users and offers several benefits to the learners, including ability to monitor and control the learning content and the flexibility to regulate the time spend on studying and learning. As a result, the learning process can be tailored to meet the specific needs of leaners, preferences and learning objectives of individual (Suresh et al., 2018; Basar et al., 2021).

Despite its advantages, e-learning also faces significant challenges that impact leaners when utilizing these platforms. Previous research done by Basar et al., (2021) indicated that 6.1% of students lacked a reliable internet connection at home, and 22.2% did not have adequate computer facilities, and had to rely on shared devices or smartphones. This finding is also similar to Shikomere et al., (2023) which indicates that the internet connection and facilities were insufficient to support online learning. Consequently, many students struggle to maintain a structured study routine during remote learning which may lead to distractions, procrastination and poor time management (Fang & White, 2024). Furthermore, decreased motivation among students and delay feedback or assistance, as instructors are not always available when needed, also contributes to an unconducive learning environment (Coman et al., 2020; Hasim et al., 2022; Sarkam et al., 2022). This lack of motivation could lead to reduce participation in the classroom discussions, decreased self-confidence, lower assignment completion rates, and a higher likelihood of course withdrawal (Rone et al., 2023). Apart from that, it was found that underutilization of online learning also contributes to an insufficient learning environment (Xia et al., 2022). For example, some students do not fully utilize discussion forums, recorded lecturer or any supplementary materials provided by the instructors. Additionally, they may lack the skills to navigate and use online learning tools effectively. This issue can significantly impact academic performance, student engagement and overall learning outcomes which potentially leading to incomprehensive research models for evaluating e-learning performance (Holm, 2024).

In Malaysia, the shortage of high-quality e-learning material is attributed to a lack of expertise, and financial resources needed for content creation (Sharin, 2021). Consequently, most of the e-learning materials is minimally interactivity and has a limited impact on learners. This problem has resulted in the lack of a comprehensive framework for evaluating the understanding of e-learning and its effects on e-learning performance (Al-Rahmi et al., 2018; Basar et al.,2021). In fact, there is limited studies that simultaneously captures and describes how the models in Higher Education Institutions (HEIs) in Malaysia affect e-learning performance (Anthony et al., 2019; Wong et al., 2020). This issue has inspired many scholars to propose a new model that could be utilized by potential users (Ugur & Turan, 2018; Dwivedi et al., 2019). As a result, identifying the factors that impact e-learning performance has become a critical focus of this study. As a first step toward overcoming these obstacles, this study is intended to proposed a new framework adapted from the unified theory of

acceptance and use of the technology (UTAUT), task-technology fit (TTF), and self-efficacy theory (SET) to enhance e-learning performance.

Literature Review

The Unified Theory of Acceptance and Use of the Technology (UTAUT)

Based on a comprehensive review, examination and synthesis of the aforementioned models, Venkatesh et al., (2003) found that the UTAUT model is capable of explaining nearly 70% of the variance in users' behavioral intentions, as illustrated in Figure 1. The results of the empirical study revealed that the UTAUT model is the most suitable framework for examining technological acceptance and adoption from a practical perspective (Chao, 2019).

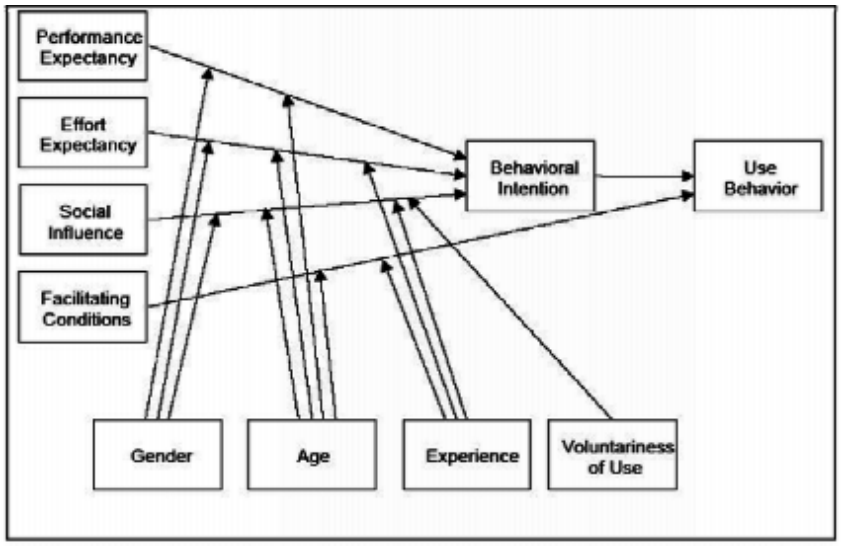

Figure 1. Unified theory of acceptance and use of technology (UTAUT)
(Adopted from: Venkatesh et al., 2003)

However, it found that the UTAUT is outdated, and current research highlights this theoretical gap. While prior theories are significant (Miles, 2017) they often overlook external factors affecting behavior performance (Venkatesh et al., 2008). Consequently, behavioral intention does not account for exogenous variables that may hinder or facilitate behavior (Moghavvemi et al., 2013; Ajzen, 2020). Meanwhile, there is disagreement and incoherence between previous studies that did not consider individual characteristics such as attitude and self-efficacy as significant predictors of behavior intention to adopt technology (Venkatesh et al., 2003; Moghavvemi, 2015) which posits that measuring specific attitudes and self-efficacy is not synonymous with measuring overall computing ability toward a specific system or technology (Straub, 2009; Mikusa, 2015). Moreover, it was noted that due to inequalities in access to education in underdeveloped countries, inadequate facilitating conditions exist among university students, since online usage penetration is low and students lack a thorough understanding of how to successfully use e-learning technologies (Qiao et al., 2021). Due to certain limitations, the task-technology fit (TTF) model that proposed by Goodhue and Thompson (1995) was incorporated in this study in order to provide a comprehensive view of technology acceptance and to broaden the scope of the future research.

Task-Technology Fit (TTF)

Over the past two decades, task-technology fit (TTF) has been widely utilized and recommended as a framework for connecting information technology with individual performance in the context of online learning approaches (Liu et al., 2023). This study offers a framework for assessing the implementation of the TTF model to explore the relationship between an individual's task performance and the utilization of technology within an e-learning system (Hidayat et al., 2021). The foundation TTF model, depicted in Figure 2, serves a tool for analyzing technology adoption and the value it generates from this perspective (Goodhue & Thompson, 1995).

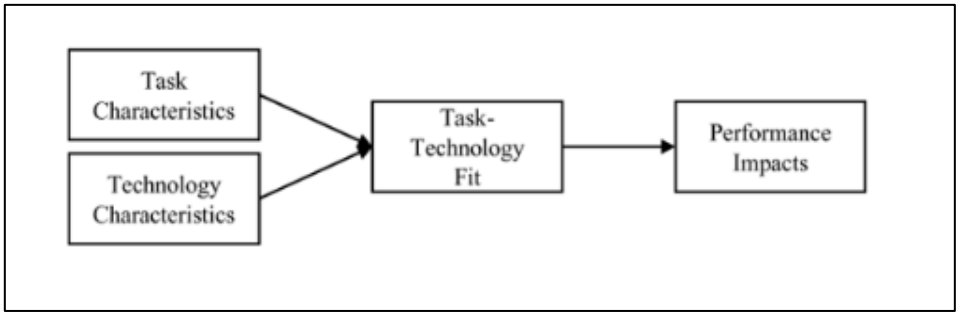

Figure 2. Task-technology fit (TTF)
(Adopted from: Goodhue & Thompson, 1995)

In this context, TTF refers to the degree to which a technology supports an individual in accomplishing the tasks (Howard & Rose, 2019) and it is influenced by the interaction between task characteristics and the capabilities of the technology (Alyoussef, 2023). Based on the past research conducted by Goodhue & Thompson (1995) identified several key dimensions for measuring fit, including data quality, data locatability, authorization to access data, data combability, training, production timeliness, and information system relationship with users which indicating that for technology to have a positive impact, a strong task-technology fit (TTF) is essential in this perspective. Hence, when technology aligns well with the task characteristics, it ought to result in enhanced performance (Jeyaraj, 2022). Furthermore, integrating UTAUT and TTF can create a comprehensive model that addresses both user perceptions and the practical fit of technology. In this integrated model, the constructs of UTAUT, including performance expectancy, effort expectancy and social influence play a crucial role in shaping user intentions and behavior while the TTF construct helps assess whether it is a good fit for the tasks they need to perform (Al-Rahmi et al., 2022). By combining UTAUT and TTF, the integrated model offers a more holistic view of technology adoption, which encompasses both psychological aspects that influence user acceptance and the practical synergy between technology and task requirements (Du & Lv, 2024). By leveraging the strengths of both models, organizations can design and implement technologies that are both effective and widely adopted, ultimately enhancing performance

Self-Efficacy Theory (SET)

Self-efficacy theory (SET), introduced by psychologist Albert Bandura in 1977, is a fundamental concept in psychology that examines an individual's belief in their ability to perform actions necessary to manage prospective situation (Bandura, 1977). This concept emphasizes the role of self-belief in influencing motivation, behavior, and performance. At its

heart, SET posits that self-efficacy is the belief in one's capability to effectively handle specific situations or achieve a particular goal, as demonstrated in Figure 3.

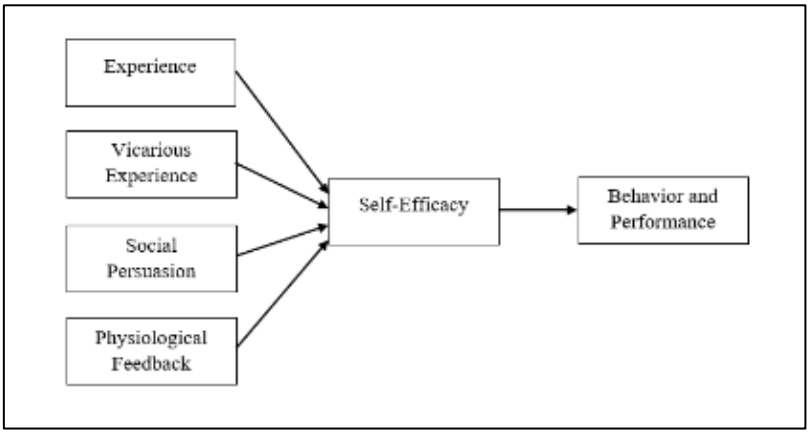

Figure 3. Self-efficacy theory (SET)
(Adopted from: Bandura, 1977)

This belief plays a crucial role in shaping how individuals tackles goals, tasks, and challenges. Bandura (1977) identified four key sources that influence self-efficacy such as personal experience, social persuasion, vicarious experience, and physiological feedback. In this context, the rooted in social cognitive theory by Albert Bandura, self-efficacy refers to one's belief in their ability to carry out the necessary actions to accomplish the specific goals. In this perspective, digital readiness can be considered a form of self-efficacy in the digital domain, influencing how effectively individuals can navigate and utilize digital learning environments. When digital readiness is considered as a mediator, it implies that higher levels of self-efficacy can enhance an individual's preparedness and capability to engage with digital technologies which in turn positively impacts their performance in e-learning settings (Osman et al., 2021). Hence, by combining UTAUT, TTF and SET models provides a comprehensive framework for understanding technology adoption and utilization. Digital readiness, as conceptualized by self-efficacy, is a crucial factor in shaping technology acceptance and perceived fit between technology and tasks. This integrated approach can help organizations design better interventions to enhance technology adoption and performance.

The Proposed Framework

In this study, the proposed research framework has been adapted from the unified theory of acceptance and use of technology (UTAUT) that proposed by Venkatesh et al., (2003), the task-technology fit (TTF) model as proposed by Goodhue & Thompson (1995), and the self-efficacy theory (SET) model that proposed by Bandura (1977) as the underpinning theories, as demonstrated in the Figure 3. The UTAUT framework offers a strong basic for examining the determinants of technology acceptance, emphasizing the elements such as performance expectancy, effort expectancy, social influence, and facilitating conditions (Dwivedi et al., 2019; Hasim et al., 2023). The TTF model complements this by emphasizing the importance of the alignment between the technology and the tasks it supports, which is crucial for ensuring that the technology enhances individual performance (Vongjaturapat, 2018). Meanwhile, SET underscores the role of individuals' beliefs in their capabilities to effectively

use technology, which is essential for fostering confidence and motivation in digital readiness (Bandura, 1977).

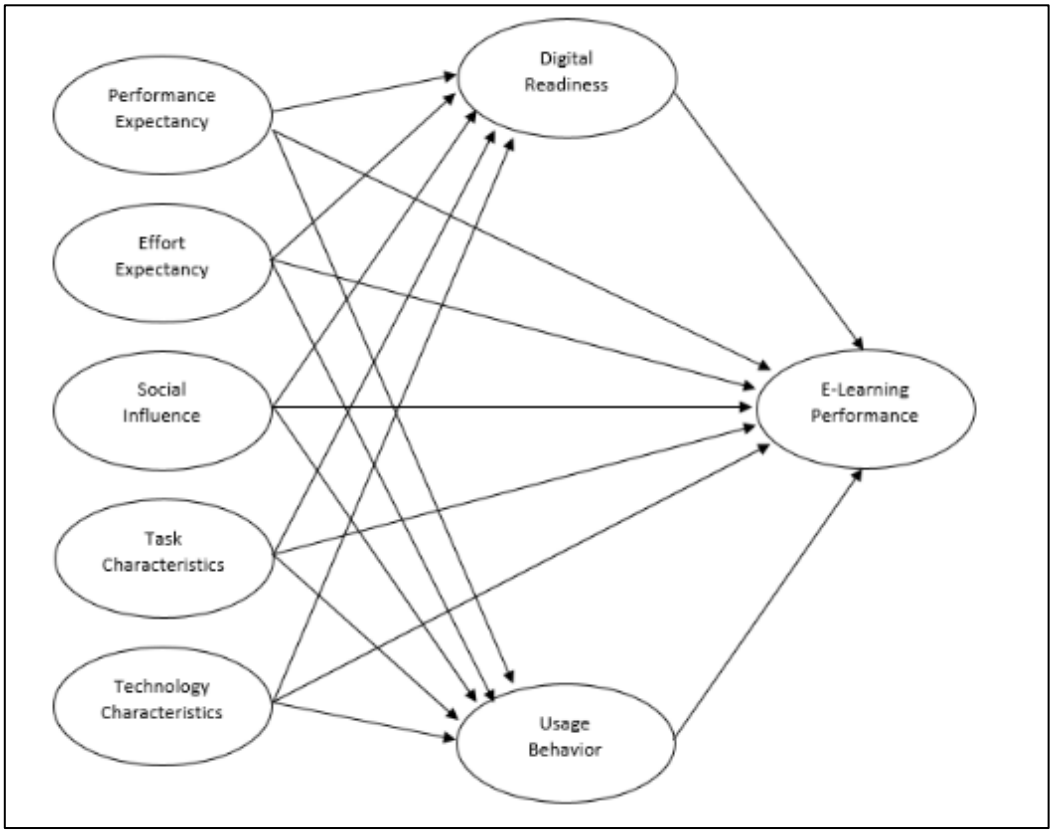

Figure 3. The proposed framework

However, according to Dwivedi et al., (2019) the UTAUT model fails to account for certain crucial relationships, and some factors, such as facilitating conditions and behavioral intention, may not be relevant in all contexts. Consequently, removing these constructs could lead to a more precise interpretation of the results, as they have been shown to be unreliable and weak predictors (Ajzen, 2020; Hasim et al., 2023). Furthermore, this study incorporates task characteristics and technology characteristics as the primary antecedents, following the task-technology fit (TTF) model proposed by Goodhue & Thompson (1995). However, the task-technology fit variable was excluded in this study. This approach is informed by previous studies conducted by Park (2019) & Granic (2023) have highlighted limitations in the explanatory power of the task technology-fit variable. Consequently, some researchers have opted to remove or modify the task technology-fit variable to better align with integrated models. These adjustments underscore the evolving nature of the TTF model as researchers strive to improve its applicability and effectiveness in various contexts. Finally, the study has employed self-efficacy theory (SET) to illustrate how individuals' beliefs in their capability to perform actions necessary for achieving specific goals (Bandura, 1977). In this regard, digital readiness has been introduced as new mediating variable in this study and can be considered a form of self-efficacy in the digital domain, affecting how proficiently a person can navigate and use digital learning environments (Kim et al., 2019; Osman, 2021) which consolidates technical competencies, computer self-efficacy, and self-directed learning into a unified construct or known as a single parent construct in this context. This new model integrates the components from the UTAUT, TTF and SET models, providing a more comprehensive

approach to examining the antecedents of e-learning and their impact on e-learning performance. It aims to offer a holistic perspective for understanding and improving outcomes in e-learning environments.

The Rationale for Integrating the UTAUT, TTF and SET Models

In this study, the development of the proposed research model was incorporated with the unified theory of acceptance and use of technology (UTAUT) by Venkatesh et al., (2003), the task-technology fit (TTF) model proposed by Goodhue & Thompson (1995), and self-efficacy theory (SET) proposed by Bandura (1977). Generally, UTAUT was used to understand and predict how individuals adopt and use the latest information technology (IT) and systems in various contexts (Abbad, 2021). UTAUT seeks to explain the factors that influence an individual's intention to use technology and their actual usage behavior (Khan et al., 2021), while TTF was predominantly utilized to evaluate the alignment or compatibility of a particular technology with the tasks or processes (Spies et al., 2020).

Based on previous studies, it has been demonstrated that the UTAUT and TTF theories possess robustness and significance (Faqih & Jaradat, 2021). These theories offer valuable perspectives on the determinants of technology adoption and usage (UTAUT) and the need to align technology with activities and job requirements (TTF) (Al-Rahmi et al., 2022). It also indicates that UTAUT and TTF theories can provide a more comprehensive understanding of how individuals interact with technology in the workplace or other settings (Wan et al., 2020). Initially, UTAUT focuses primarily on the behavioral intentions and actual utilization of technology by users, emphasizing such factors as performance expectancy, effort expectancy, social influence, and facilitating conditions (Venkatesh et al., 2012; Zuiderwijk et al., 2015; Dwivedi et al., 2019). The framework presented offers a comprehensive structure for comprehending the factors influencing an individual's decision to adopt or abstain from utilizing technology (Wedlock et al., 2019). On the other hand, TTF focuses on how well technology is aligned with certain tasks and how this alignment impacts user performance (Rai & Selnes, 2019) and offers insights into the outcomes of technology use by assessing its fit with tasks (Ratna et al., 2020). Together, these models address both individual user perceptions and the technical compatibility of technology, offering a multidimensional perspective. This integration aligns with the notion that user adoption is not solely a behavioral phenomenon but is also influenced by the practical utility of technology for task completion (Spies et al., 2020).

In addition, it also indicates that self-efficacy significantly influences how individuals approach challenges, set goals, and persist in overcoming obstacles. In the context of technology adoption, digital readiness, a manifestation of self-efficacy, has been shown to mediate relationships between various psychological and behavioral constructs. For instance, Osman et al., (2021) demonstrated that digital readiness mediates the relationship between psychological motivation and e-learning performance, as well as between online peer collaboration and engagement. This underscores self-efficacy's role in enhancing individual preparedness and confidence in navigating digital environments, which directly impacts on the e-learning performance. The mediating role of self-efficacy is well-documented in various studies. Osman et al., (2021) found that digital readiness mediates the relationship between psychological motivation and e-learning performance. Similarly, Getenet et al., (2024) argued that digital self-efficacy enhances performance expectancy and effort expectancy, while also

improving task-technology alignment. Incorporating SET into the UTAUT and TTF models provides a comprehensive understanding of technology adoption by addressing individual psychological readiness alongside behavioral and task-specific factors. The integration of SET as a mediator within UTAUT and TTF models enriches our understanding of technology adoption by linking individual capabilities to perceptions of usability and task fit. Self-efficacy, conceptualized as digital readiness, bridges the gap between behavioral intentions and practical application, enhancing technology adoption and user performance

Research Methodology

In this study, a questionnaire-based survey method was employed to gather the large-scale data. A total of 1092 samples from the first-year students were utilized as the unit of analysis in this investigation, employing a simple random sampling plan. The study has adopted an online survey to reach most respondents possible to ensure sample sizes are adequate for quantitative data analysis using SPSS version 29 to generate the descriptive statistics, missing data, outlier, and normality test, as well as employing covariance based structural equation modeling (CB-SEM) for advance analysis (Memon et al., 2020). The sample of this study were successfully collected from the social sciences students in the Malaysian Technical University Network (MTUN) comprising of Universiti Teknikal Malaysia Melaka (UTeM), Universiti Tun Hussein Onn Malaysia (UTHM), Universiti Malaysia Pahang Al-Sultan Abdullah (UMPSA), and Universiti Malaysia Perlis (UniMAP) who are currently in the first-year students' intake 2021/2022 that utilizing e-learning system during the COVID-19 pandemic. The main reason for selecting a social science background for this study is to discover the self-efficacy, readiness and engagement of the social science students towards e-learning performance, as the past research have indicated that students who participated in engineering education had significantly higher self-efficacy and readiness in using e-learning system compared to those who are from social sciences background (Mamaril et al., 2016; Hasim et al., 2022; Hasim et al., 2024). It also claims that social sciences students are still lack of employability skills and should boost more their self-efficacy, engagement, and readiness in term of technical action, communication action, information action and computational action (Blayone et al., 2018). Hence, first-year students were the most appropriate samples in this study, as opposed to second-year students and others, since most of them are familiar with and have adapted well to the new learning system.

To further validate the results, the researcher then adopted a confirmatory approach to access the reproducibility of the findings by utilizing either a split sample from the original dataset or an independent sample that derived from it (Hair et al., 2014). This independent sample was utilized for exploratory factor analysis (EFA) to identify the underlying factors of the measurement items, while confirmatory factor analysis (CFA) was employed to validate the outcomes from the EFA. A distinctive sample size in SEM of about 200 is adequate for the analysis of an EFA model (Worthington & Whittaker, 2006; Kyriazos, 2018). The sample size rule is needed by the CFA to produce inferential statistics. However, this number does not apply to EFA. By utilizing the full sample, the analysis procedures for this research are followed by analyzing the measurement model of all constructs to check the structural model for the goodness of fit (GOF) (Mohamad et al., 2019). Preacher & Hayes (2008) recommended that the bootstrapping technique is a computationally intensive method that involved repeatedly sampling from the dataset to estimate both the direct and indirect effects in each resampled dataset, embedded in the AMOS software for conducting mediating analysis (Preacher et al.,

2010). Finally, the findings were validated to proposed a new framework integrated from the unified theory of acceptance and use of the technology (UTAUT), task-technology fit (TTF), and self-efficacy theory (SET) to enhance e-learning performance.

Conclusion

In conclusion, it can be concluded that e-learning has transformed contemporary education by offering adaptable, accessible, and affordable learning opportunities, especially in the post-COVID-19 era. However, its effectiveness is often hindered by challenges such as inadequate infrastructure, unreliable internet access, underused resources, and a lack of motivation among learners (Osman et al., 2021). These challenges have resulted in shortcomings in e-learning assessment and a lack of robust research frameworks to effectively measure e-learning performance. To address these challenges, this study has proposed a novel framework that integrates the unified theory of acceptance and use of technology (UTAUT), task-technology fit (TTF), and self-efficacy theory (SET). By integrating these models, the framework seeks to pinpoint critical factors influencing e-learning performance and offer actionable recommendations to improve learner engagement and outcomes.

Furthermore, the proposed framework not only contributes to the theoretical knowledge of e-learning performance but also provides practical insights for educators, practitioners, and policymakers. It emphasizes the importance of addressing technological, individual, and task-related factors to enhance the effectiveness of e-learning systems. Through this approach, it aims to improve the educational experience, especially within higher education institutions (HEIs), and facilitate the development of more efficient e-learning platforms in the future. Finally, this study highlights the necessity for additional research and collaborative efforts to address current challenges and fully harness the potential of e-learning in addressing the changing demands of learners globally.

Research Contribution

Based on this the proposed framework, it indicated that this study has makes a significant theoretical contribution by integrating the unified theory of acceptance and use of technology (UTAUT), task-technology fit (TTF), and self-efficacy theory (SET) into a novel framework that holistically examines e-learning performance that addressing the gaps in existing models that often overlook individual capabilities and task-technology alignment. By introducing digital readiness as a mediating construct rooted in self-efficacy, the study enriches the understanding of how psychological, behavioral, and technological factors interplay to influence e-learning outcomes (Osman et al., 2021; Getenet et al., 2024). Contextually, this study is pivotal in the Malaysian higher education landscape, where e-learning systems face challenges such as limited infrastructure, underutilization, and varying student readiness (Basar et al.,2021; Shikomere et al., 2023). The framework offers practical insights for educators and policymakers to design more effective e-learning environments, particularly for social science students who typically exhibit lower digital self-efficacy in this context. Finally, this study advances existing knowledge by proposing a comprehensive model that not only explains technology adoption and performance in e-learning but also serves as a practical guide to enhancing learner engagement and system effectiveness in the post-pandemic educational context and it the proposed framework can be applied in other settings for future research directions.

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