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Adoption of Online Distance Learning in Malaysian Higher Education: A Mixed-Methods Analysis of Key Influencing Factors

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Abstract

Digital technologies have profoundly reshaped the global higher education landscape, with online distance learning emerging as a pivotal mechanism for enhancing the accessibility and flexibility of quality education. Focusing on the unique Malaysian context, this study seeks to comprehensively examine the complex and interrelated factors affecting the effectiveness and adoption of ODL, with a specific emphasis on the institutional, technological, and psychological dimensions that shape the learner experience. Employing an explanatory sequential mixed-methods design, the research's quantitative phase utilized an online survey disseminated via stratified sampling to recruit 250 respondents, thereby ensuring a representative cohort. This was followed by a qualitative phase consisting of semi-structured interviews with 20 participants who were purposely selected from the initial sample to provide rich, elucidative insights. This methodological triangulation strategically enhances the credibility and trustworthiness of the findings, thereby significantly improving the overall rigor and robustness of the study. The findings highlight that student resilience within ODL environments is not merely an inherent individual attribute but is dynamically co-constructed through reliable institutional structures, accessible technological infrastructure, and supportive social relationships. Optimal ODL outcomes demand an integrated strategy that synergizes technology with pedagogical excellence, equitable infrastructure, and learner motivation to urgently resolve rural-urban divides and administrative barriers.

Keywords: Online Distance Learning, Institutional, Technological, Psychological, Mixed Method

Introduction

The rapid growth of digital technologies has significantly transformed higher education worldwide. Online Distance Learning (ODL) has become a crucial means of making quality education more accessible. The COVID-19 pandemic accelerated this change by prompting schools worldwide to transition to remote teaching. This change demonstrated

how technology can be utilized in education, but it also highlighted significant disparities in digital access and readiness for teaching.

In Malaysia, three key factors that can impact the success of ODL are support systems within schools, the quality of digital infrastructure, and student motivation. Institutional support, which includes how easy it is for instructors to reach students and how well the Learning Management System (LMS) is designed, is the most important part of good ODL delivery. Research consistently shows that instructor presence and timely feedback have a significant impact on student engagement and course completion rates (Ahmad et al., 2023). Similarly, LMS usability has been linked to lower cognitive load and improved learning outcomes. However, Malaysian schools face their own challenges in implementing these supports.

The digital divide is another significant problem for ODL in Malaysia. Internet access is generally reliable in cities, but in rural areas, especially in East Malaysia, it is not always reliable and tends to be slower (Fang et al., 2022). The high cost of devices exacerbates these problems. For example, students from low-income families often lack the necessary hardware for optimal learning experiences. These infrastructure constraints significantly intersect with psychological factors; learner motivation and self-regulation have been recognized as essential mediators between access to technology and academic persistence. The notion of perceived usefulness, originating from the Technology Acceptance Model (TAM) developed by Abdullah and Ward (2015), is particularly pertinent in elucidating why certain students excel in ODL environments while others become disengaged.

Understanding the factors influencing the adoption of Online Distance Learning (ODL) is vital because, while digital technology has reshaped global higher education by enhancing accessibility and flexibility, significant systemic gaps remain in its effective implementation. In Malaysia, despite a 35% increase in ODL enrollment since 2020, completion rates (60%) lag behind traditional face-to-face programs (75%), signaling a critical need to investigate the institutional, technological, and psychological barriers that hinder student success. This study is highly significant as it provides timely, evidence-based insights for policymakers and educational leaders to bridge the digital divide—particularly between rural and urban areas—and improve the utility of Learning Management Systems (LMS). By focusing on the interplay of instructor accessibility, infrastructure reliability, and learner motivation, the research offers a comprehensive framework to enhance the ODL ecosystem, ultimately making quality education more equitable and inclusive for diverse learners, including those from low-income backgrounds.

This study aims to investigate these interrelated factors within Malaysia's distinctive socio-educational framework. Previous research has examined discrete components of ODL success; however, there is a scarcity of studies that employ a comprehensive framework integrating institutional, technological, and psychological dimensions concurrently. This research aims to elucidate the relative contributions of various factors and their interactions, providing evidence-based recommendations for policymakers, institutional leaders, and educators seeking to enhance Malaysia's ODL ecosystem.

Problem Statement

Although Malaysia has invested significantly in digital education infrastructure and more people are utilizing ODL, it still faces challenges that hinder its effectiveness and fairness for all. Since 2020, enrollment in ODL programs has increased by 35% (MOHE, 2023), but the completion rate remains at approximately 60%, which is significantly lower than the 75% rate for traditional face-to-face programs. This gap indicates systemic obstacles that transcend mere technological access, highlighting significant deficiencies in institutional support frameworks, the adequacy of digital infrastructure, and learners' readiness for online education.

A major concern is that the quality of institutional support for ODL students is not consistently high. Many students say they have trouble using the LMSs that Malaysian universities have set up, and they also say that their teachers do not provide them enough academic help (Tripathi, 2022). The transactional distance between learners and educators appears to be exacerbated by the fact that instructors are not always available, and many of them lack specialized training in online teaching.

The digital divide is another major concern for ODL equity. Approximately 30% of rural homes in East Malaysia lack reliable internet access, and the high cost of devices remains a significant challenge for B40 students. These problems with infrastructure hit marginalized groups harder than others, which is why the term "digital exclusion" was created in education. Even when students can access the resources they need, many still struggle with self-control and motivation in environments where they must learn independently. Initial research indicates that approximately 40% of Malaysian ODL students encounter challenges in time management and sustaining consistent engagement (MOHE, 2023); however, institutions offer minimal structured support for developing these essential skills.

Research Questions/Research Hypothesis

Therefore, this study seeks to address this current gap by using a mixed-methods design to assess the following research questions and research hypothesis:

Research Question 1 :

What are the key determinants influencing the adoption of online education among distance learners in Malaysia?

Research Question 1a. How does institutional support, including instructor accessibility, LMS design, and administrative policies shape online learning adoption among Malaysian distance education students ?

Research Hypothesis 1. Greater instructor accessibility positively predicts online learning adoption among Malaysian distance education students.

Research Hypothesis 2. A well-designed LMS is associated with higher levels of student satisfaction and adoption of online learning in Malaysian distance education.

Research Question 1b. To what extent does digital infrastructure, such as internet reliability, device affordability, and platform usability affect the engagement of online distance learners in Malaysia?

Research Hypothesis 3. Students with more reliable internet connectivity report higher engagement levels in online distance learning compared to those with unstable connections.

Research Hypothesis 4: The affordability of digital devices moderates the relationship between digital infrastructure and student engagement, such that students with better device access exhibit higher engagement.

Research Question 1c. To what extent does learner motivation, specifically self-discipline and perceived usefulness of e-learning, mediate the relationship between online learning adoption and academic persistence in distance education in Malaysia?

Research Hypothesis 5. Self-discipline mediates the relationship between online learning adoption and academic persistence, with more self-disciplined students showing higher persistence rates.

Research Hypothesis 6. The perceived usefulness of e-learning strengthens the positive effect of online learning adoption on academic persistence among Malaysian distance learners.

Research Question 2

What are the perceptions and lived experiences of Malaysian distance learners that influence their adoption of ODL?

Research Question 2a. How do learners describe the role of institutional support (e.g., instructor responsiveness, LMS usability, administrative policies in shaping their engagement with ODL?

Research Question 2b. How do disparities in digital infrastructure affect urban online learners in their ODL experiences, and what solutions do they propose?

Research Question 2c. What strategies do learners employ to maintain motivation and self-discipline in self-paced ODL environments?

Significance of the Study

The study is important because it addresses the pressing need to understand what motivates students and teachers in Malaysia's growing distance education system to accept and utilize online learning platforms. This research provides timely insights relevant to policymakers, educational institutions, and learners, as education continues to transition to digital modalities globally, particularly in the aftermath of the COVID-19 pandemic-induced disruptions. Its mixed-methods approach enhances the comprehension of both quantitative trends and qualitative experiences, which are crucial for developing effective and inclusive online learning strategies.

This research contributes to the academic corpus by addressing deficiencies in technology adoption within the Malaysian context, where distinct cultural, infrastructural, and socioeconomic variables influence online education in a manner that diverges from other regions. By examining these contextual drivers, the study enhances theoretical frameworks concerning technology acceptance and tailors them to local contexts. This enriches the academic dialogue concerning distance education, rendering the findings pertinent and applicable to Southeast Asia and analogous educational contexts globally.

This research also supports broader goals, such as enhancing digital literacy and making education more accessible by addressing societal needs. Online learning can help make education fairer in Malaysia by breaking down traditional barriers based on location and income.

Literature Review

Primary types of Adoption of Online Distance Learning (ODL) within the Malaysian Higher Education landscape

The adoption of Online Distance Learning (ODL) in Malaysian higher education is typically categorized into three main levels: **institutional, technological, and psychological**. At the institutional level, adoption is driven by the strategic alignment of universities with the Ministry of Higher Education's (MOHE) National e-Learning Policy. This involves the systematic integration of Learning Management Systems (LMS) and the development of institutional frameworks that mandate or encourage the use of blended and fully online modes. For many institutions, this transition has evolved from a supplementary tool to a core operational strategy, ensuring academic continuity during crises and expanding educational reach to non-traditional students, such as working adults (Adnan & Ahyan 2024; Osman & Yasin, 2024).

Technological adoption focuses on the infrastructure and digital tools required to facilitate effective remote education. In the Malaysian context, this is characterized by a mix of synchronous platforms, such as Google Meet and Zoom, and asynchronous resources like Moodle-based LMS or social media tools like WhatsApp and Telegram (Ooi & Othman, 2025; Yap et al., 2024). However, this type of adoption is often marked by the "digital divide," where students in urban centers benefit from high-speed 5G connectivity while those in rural or lower-income (B40) groups face barriers related to internet stability and device affordability. Successful technological adoption, therefore, depends not only on the availability of software but also on the robustness of the national and campus-wide digital infrastructure.

Psychological and behavioral adoption refers to the readiness and willingness of both students and educators to embrace digital pedagogy. For students, this involves a shift toward self-regulated learning and digital literacy, where success is often mediated by their "perceived usefulness" of the platform and their intrinsic motivation (Law et al., 2025; Mohamad & Osman, 2025). For educators, adoption is tied to "technological pedagogical content knowledge" (TPACK)—the ability to effectively translate traditional curriculum into engaging online formats. This level of adoption is the most complex, as it requires overcoming resistance to change and addressing the psychological stressors associated with social isolation and the lack of face-to-face interaction common in ODL environments. (refer Table 1).

Table 1
Primary types of Adoption of Online Distance Learning (ODL) within the Malaysian Higher Education landscape

Type of Adoption	**Focus Area**	**Key Characteristics & Drivers**
Institutional Adoption	Governance & Policy	Driven by the Ministry of Higher Education's (MOHE) national policies. Focuses on integrating Learning Management Systems (LMS), staff training frameworks, and transitioning from traditional to blended or fully online degree programs.
Technological Adoption	Infrastructure & Tools	Concerns the physical and digital requirements for ODL. Includes the use of synchronous tools (Zoom/Meet) and asynchronous platforms. It is heavily influenced by the "digital divide" between urban and rural connectivity.
Psychological Adoption	Behavior & Readiness	Focuses on the "human element," including student self-discipline, digital literacy, and "perceived usefulness." It also encompasses faculty readiness (TPACK) and the ability to manage the social isolation of remote learning.

Review of Relevant Studies to Frame the Research

Research in Malaysia highlights institutional support as a crucial factor influencing the acceptance of e-learning among distance learners. Huzooree and Doargajudhur (2023) discovered that institutional elements, including training, resource accessibility, and non-credit preparatory courses, positively affected learners' readiness to embrace e-learning. Supporting infrastructures, administrative policies, and instructor accessibility have been demonstrated to enhance perceived usefulness and learner motivation, which are essential for sustained engagement.

Problems with the technological infrastructure, particularly internet access and device connectivity, remain significant issues. Fang et al. (2022) suggest that poor internet connections and expensive devices, particularly in rural areas, hinder people's ability to learn online and diminish their motivation. Mumin and Sulong (2023) found that LMS stability, system quality, and digital tools have a significant influence on learners' perceived ease of use and system acceptance. Digital literacy and readiness also affect how people adopt e-learning technologies. Learners require sufficient training and support to utilize these technologies effectively.

Learner motivation, encompassing self-discipline and perceived utility, constitutes a pivotal psychological factor that affects both technology adoption and academic persistence in distance education. The Self-Determination Theory (SDT) and Technology Acceptance Model (TAM) frameworks elucidate the process by which motivation converts external influences into enduring engagement. Ramus (2024) demonstrates that psychological motivation acts as a mediator in the relationship between positive online

learning attitudes and learner engagement in Malaysian higher education ODL contexts. High self-discipline fosters learner autonomy and perseverance, whereas perceived usefulness elevates the significance learners attribute to online education, thereby encouraging sustained engagement.

Adoption and Academic Persistence Interrelationship

Hong (2024) stresses that persistence in online learning depends on several interconnected factors, even though initial adoption is crucial. To support distance learners in Malaysia, it is essential to have high academic quality, an effective system, and effective mentoring. Learner motivation serves as a mediator that connects platform usability with ongoing engagement and academic perseverance. When motivation is high, the negative effects of technological barriers or a lack of institutional support can be mitigated, highlighting the importance of motivation.

Gaps in the Literature and Malaysian Context

While many studies examine institutional, technological, and psychological determinants in isolation, a research gap exists in synthesizing these factors into a cohesive framework that addresses the context of Malaysian distance learners. Few studies explicitly examine the mediating role of learner motivation in the context of adoption and persistence, particularly in light of the socio-economic and digital readiness disparities specific to Malaysia.

This body of research collectively illustrates that the perceptions and lived experiences of Malaysian distance learners are shaped by the interaction of institutional, technological, and psychological factors. To improve ODL adoption and success, institutions must be committed to enhancing training, teaching quality, and policy flexibility. They also need to have strong and accessible technology infrastructure and strategies to encourage student motivation and self-discipline. However, despite the increasing use of it due to national policies and changes resulting from the pandemic, many learners still struggle to adjust, which necessitates more comprehensive interventions tailored to the Malaysian ODL context.

Conceptual Framework of the Study

The conceptual framework examines the interaction of institutional, technological, and motivational factors influencing LMS adoption and persistence among Malaysian distance education students (refer Figure 1). Institutional support is crucial because it makes instructors more accessible, leading to increased LMS adoption (H1), and ensures that LMS design is effective, thereby making users happier (H2).

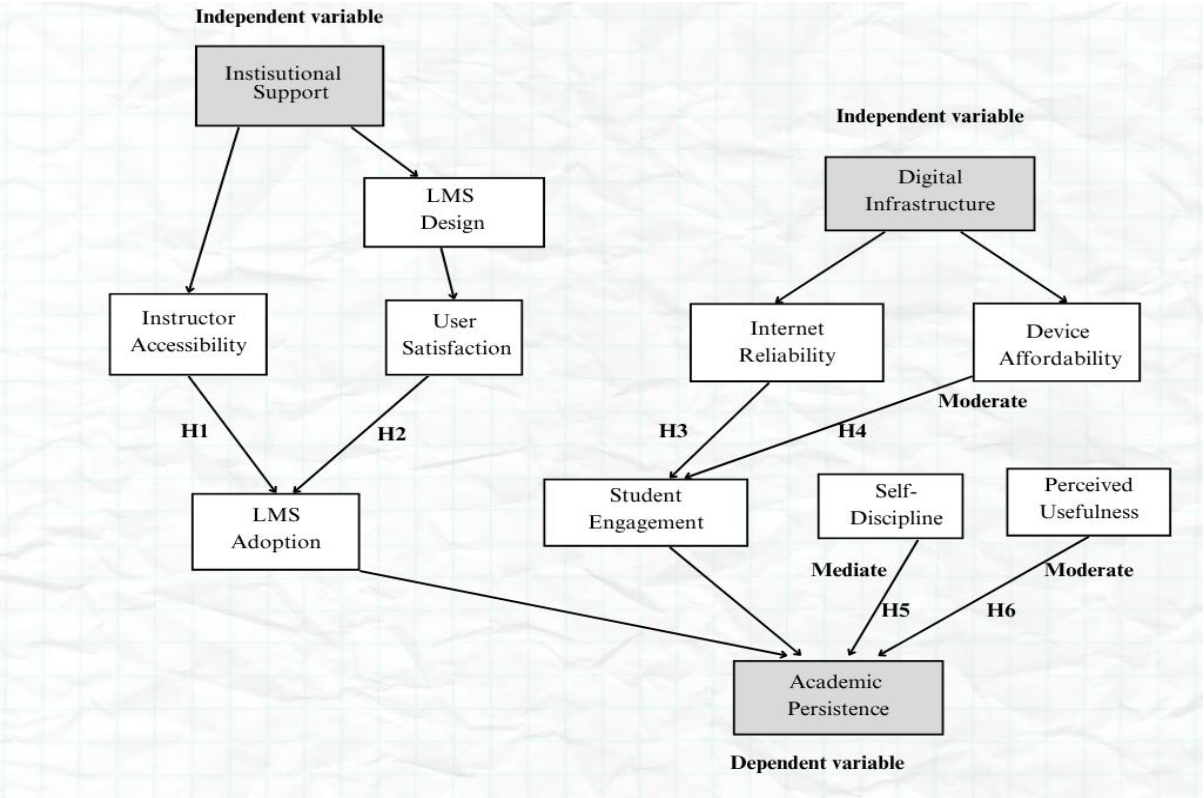

Figure 1 *The Conceptual Framework*
Notes: This figure illustrates the conceptual framework, which outlines the relationship between the independent variable and the dependent variable.

Digital infrastructure also affects success by making the internet reliable, which is crucial for engaging students (H3), and by making devices affordable, thereby mitigating the impact of infrastructure on learning outcomes (H4). Reliable access and affordable technology are essential for equitable participation in online education.

Lastly, learner motivation is extremely important, and self-discipline (H5) and perceived usefulness (H6) are two factors that directly affect LMS persistence. Students who are disciplined or understand the value of the LMS are more likely to continue using it. This framework provides a comprehensive understanding of the factors influencing effective LMS implementation and sustained academic persistence in distance learning contexts, incorporating institutional, technological, and psychological perspectives.

The framework hypothesizes direct effects where institutional support—operationalized as instructor accessibility (H1) and LMS design quality (H2)—enhances teaching presence and course structure, directly fostering LMS adoption. Simultaneously, dependable digital infrastructure (H3) promotes engagement by ensuring usability, a relationship grounded in the TAM.

The model further incorporates key moderating and mediating mechanisms. Socioeconomic reality is integrated by hypothesizing that device affordability (H4) moderates the effect of digital infrastructure on engagement, reflecting principles of the Digital Divide Theory. Finally, psychological mechanisms are central to persistence; self-discipline (H5) is posited to sustain effort directly, while perceived usefulness (H6) mediates the relationship

between institutional/technological support and motivation by enhancing the LMS's perceived value, drawing on the synergy between SDT and TAM.

Theoretical Framework

To comprehend the reasons individuals embrace new technologies, the factors that lead to persistence or abandonment, and the role of motivation in these outcomes, it is essential to synthesize various theoretical frameworks. We examine the interplay of institutional support, technological infrastructure, and psychological motivation in influencing the transition from adoption to sustained engagement, grounded in the Technology Acceptance Model (TAM), Digital Divide Theory, and Self-Determination Theory (SDT).

Role of Institutional Support in Technology Adoption (TAM)

Institutional support is a key factor in users' willingness to adopt technology, as it influences their perception of it and reduces the barriers to its use. Abdullah and Ward (2015) assert that the Technology Acceptance Model (TAM) identifies two fundamental determinants of adoption behavior: perceived usefulness (the conviction that a system enhances performance) and perceived ease of use (the conviction that minimal effort is required). Strong institutional support in the form of thorough training, well-defined policies, and dedicated leadership can directly improve these perceptions (Pannen et al., 2023). Accessible troubleshooting resources and visible leadership endorsement, for example, reduce user anxiety, making it less scary to use technology (Kusumadewi et al., 2021).

Strong institutional support shows that technology is both useful and easy to use, which encourages early adoption and deeper integration into workflows. Kusumadewi et al. (2021) demonstrate that users who receive more support from their institutions are more likely to utilize the product, are more satisfied with it, and adopt it more quickly. Conversely, a lack of interest in the organization's climate can lower motivation and perpetuate resistance (Pannen et al., 2023). This corresponds with TAM's claim that external assistance enhances perceived utility and user-friendliness, which are essential for sustained engagement (Abdullah & Ward, 2015).

The interaction of institutional, technological, and psychological factors comprehensively influences LMS outcomes. Institutional support, including training, policies, and instructor accessibility, functions as an external facilitator within the Technology Acceptance Model (TAM), enhancing users' perceptions and behavioral intentions (Abdullah & Ward, 2015). This framework combines Self-Determination Theory (SDT) and Digital Divide Theory to demonstrate how institutional support systems can address both technological challenges and mental health issues.

Technological Infrastructure and Dropout (Digital Divide Theory)

Although institutional support may facilitate initial LMS adoption, ongoing engagement is fundamentally contingent upon the quality of technological infrastructure. Hartnett (2019) emphasizes that the Digital Divide Theory identifies access disparities—such as unreliable internet, outdated hardware, or inadequate digital resources—as systemic barriers that disproportionately affect marginalized groups. These disparities result in participation gaps that transcend adoption, influencing long-term outcomes.

Bad infrastructure causes numerous problems, which frustrates users and makes them less likely to engage. Even learners who are highly motivated struggle to stay engaged in environments that lack technology, as long-term barriers hinder both their skills (for example, being unable to use tools effectively) and their intrinsic motivation. Empirical studies consistently link insufficient infrastructure to elevated attrition rates, highlighting the necessity for institutional investment in technology as a retention imperative (Hartnett, 2019).

The Digital Divide Theory elucidates the ways in which technological conditions facilitate or hinder LMS persistence. For everyone to participate fairly, reliable internet, affordable devices, and up-to-date software are necessary. Where these are absent, disparities exacerbate dropout risks, especially for low-income users, thereby impeding active engagement. Addressing these gaps is crucial not only for initial access but also for maintaining motivation and decreasing attrition, in accordance with SDT's focus on competence support and TAM's emphasis on perceived usefulness (Tripathi, 2022).

Psychological Mediation: Motivation as a Bridge (SDT)

Motivation is a crucial psychological intermediary between external factors (e.g., institutional support, technology quality) and technology adoption outcomes (Chiu, 2021). It encompasses intrinsic motivation, which stems from personal interest, and extrinsic motivation, which originates from external rewards. SDT emphasizes that promoting autonomy, competence, and relatedness enhances intrinsic motivation, which is essential for sustained LMS engagement. Learners who believe they are skilled at using LMS tools, can make their own decisions, and have social connections are more likely to persist, especially if they perceive the tool as useful and possess self-discipline (Tripathi, 2022).

Combining SDT with TAM shows that LMS success depends on more than just institutional support and digital infrastructure. It also depends on fostering internal motivation. When institutions promote autonomy, enhance competence, and foster relatedness, motivation transforms into a conduit that intensifies engagement. This persistence, driven by motivation, can compensate for technological flaws, as users who are intrinsically motivated are less likely to quit even when things aren't going well (Alamri et al., 2020).

Identification of Gaps

There is a substantial deficiency in the literature regarding online distance learning in Malaysia. Kumar et al. (2021) and other researchers have examined individual influencing factors, including technological infrastructure, institutional support, and psychological traits. There is an absence of comprehensive models that synthesize these dimensions to elucidate their collective impact on student adoption and persistence.

Additionally, there is an inadequate examination of the mediating role of learner motivation. Motivation, particularly self-discipline and perceived utility, has been recognized as crucial for sustaining engagement and academic perseverance in ODL. However, Mumin and Sulong (2023) highlighted that there is a lack of empirical studies examining the mediating role of this factor between adoption factors (e.g., platform usability, institutional support) and learners' academic persistence in the context of Malaysian distance education.

Methodology

This study employed an explanatory sequential mixed-methods design to examine the adoption of ODL among Malaysian distance learners. The research is conducted in two phases: initially, a quantitative survey is distributed to a wide sample of learners to ascertain key determinants, including institutional support, technology access, instructor availability, and learner motivation, that affect ODL adoption. Statistical analysis evaluates hypotheses (H1-H6) to ascertain the significance and strength of these factors. This phase provides measurable and generalizable data on adoption trends, establishing a foundation for further exploration.

In the second phase, semi-structured interviews are administered to a deliberately chosen subset of survey participants to investigate learners' lived experiences (RQ 2a-c). This qualitative phase investigates the "how" and "why" underlying the quantitative results, revealing personal narratives regarding engagement, motivation, and persistence in ODL. The study elucidates the intricate ways in which institutional, technological, and psychological factors influence learners' experiences by situating statistical patterns within comprehensive, descriptive insights. This sequential methodology ensures that qualitative data directly enhance and elucidate preliminary quantitative findings.

The combination of quantitative breadth and qualitative depth meets the need for methodological pluralism in educational research (Creswell, 2018). The study integrates extensive survey data with comprehensive interviews, connecting the "what" of adoption rates to the "why" of behavioral patterns. This dual perspective presents both generalizable trends and contextualized insights, yielding a comprehensive understanding of ODL adoption in Malaysia (Creswell, 2018).

Pool of Subjects

The target population of this study comprises Malaysian distance learners enrolled in private higher education institutions. These are specifically undergraduate and postgraduate students enrolled in online courses via distance learning modalities at these institutions. This population is selected because private institutions significantly influence Malaysia's higher education sector by catering to a substantial number of distance learners and addressing the growing demand for adaptable, online learning alternatives.

To ensure that important socio-demographic variables, particularly income levels, were well represented, a random stratified sampling method was employed. Stratification by income is essential because the affordability of technology and internet access (associated with income) is a crucial factor in the adoption of online learning, as indicated in hypothesis H6 of the conceptual framework. Stratifying the sample aids in reflecting the diversity of learners' economic backgrounds, thereby enhancing the generalizability of the results. The sample's inclusion criteria consisted of learners who had enrolled in a minimum of one online course within the preceding two years and possessed access to fundamental digital devices.

Using G*Power, we found that we need at least 250 respondents to get a power of 0.8 at a standard alpha level of 0.05. This sample size strikes a balance between accuracy and practical issues, such as accessibility and the availability of resources for data collection.

Data Collection

The institutional factors section has a Cronbach's alpha of 0.82, indicating that it is highly reliable. It measures how students feel about the accessibility of their instructors, the usability of the LMS, and the policies of the school 0.79. Technological factors, with a reliability of 0.75, look at the reliability of the internet, the ability to access devices (measured by just one item), and the ease of use of platforms, with a focus on the quality of the technological infrastructure. Psychological factors, based on SDT, consist of five items evaluating self-discipline (0.84) and perceived usefulness (0.88), reflecting learners' motivation, self-management, and perceived advantages of ODL. These sections together provide a comprehensive picture of how institutional, technological, and psychological factors influence the ODL experience.

The qualitative phase of the study employed semi-structured interviews, each lasting approximately 45 to 60 minutes, directed by the research questions to thoroughly investigate learners' experiences. Interview participants were selected via purposive sampling from the cohort of survey respondents who expressed a willingness to engage in subsequent interviews.

Twenty participants (10 Females and 10 Males) were intentionally selected according to the inclusion criteria, which required them to have completed at least one online course within the past two years and to possess access to basic digital devices. This method allows interviewers the freedom to ask follow-up questions and clarify answers while still keeping the conversation focused on important topics related to how learners feel about and have experienced ODL adoption.

Before full implementation, the survey was pilot-tested to check for internal consistency. All scales showed acceptable reliability (Cronbach's alpha > .7), which proved that the instrument was valid for measuring the intended constructs. The interview protocol was also tested with three learners to see if the questions were clear and flowed well. Any questions that were unclear were clarified to ensure that the collected data was rich and relevant.

Data Analysis

After gathering the data, we used SPSS, a statistical program, to test ideas about how different variables might be related. For example, regression analysis can find out if technological readiness is a good predictor of whether or not someone will adopt online learning.

Thematic analysis was employed to systematically code and interpret the data, elucidating recurring patterns (Kiger & Varpio, 2020). NVivo 14 was used to systematically organize and analyze the interview transcripts, making coding and theme development easier. Furthermore, member checking was employed to enhance the credibility and reliability of the findings by allowing participants to review and validate the accuracy of the interpreted data.

This qualitative analysis illuminated the contextual foundations of the quantitative results, with interview data clarifying the specific influences of institutional policies, technological challenges, and psychological factors on learners' experiences in ODL.

This mixed-methods study employed triangulation (survey and interview data) to enhance the reliability of the current study. This triangulation enhances credibility (truth value) in qualitative components and bolsters internal validity in quantitative components, thereby strengthening the overall rigor of the study (Carter et al., 2014). Moreover, ongoing comparison and member checking in qualitative analysis enhance confirmability and credibility, whereas the quantitative phases were meticulously regulated to control for confounding variables and were sufficiently powered to guarantee reliability and validity (Doyle et al., 2016).

Prior to data collection, ethical approval was obtained from the University's Institutional Review Board. Informed digital consent was secured from all participants, who were advised of the study's aims, their right to withdraw without penalty, and guarantees of confidentiality. To protect participant privacy, identifying details were omitted, pseudonyms were assigned the qualitative analysis, and quantitative data were reported in aggregate.

Results

Research Question 1

What are the key determinants influencing the adoption of online education among distance learners in Malaysia? Table 1 illustrates that instructor accessibility was the most important factor in whether or not students would use online learning ($\beta = 0.35$, $*p* < 0.01$). This means that students who think instructors are more accessible are much more likely to use e-learning. Also, the design of the LMS had an indirect effect on adoption through student satisfaction ($\beta = 0.18$, $*p* = 0.002$).

Table 1
Inferential Statistics

Hypothesis	**Predictor → Outcome**	**Effect size**	**p-value**	**95% CI**	Result
H1	Instructor accessibility → Adoption	β = 0.35	0.001	[0.21, 0.49]	Significant
H2	LMS design → Satisfaction → Adoption	β = 0.18 (indirect)	0.002	[0.08, 0.28]	Significant mediation
H3	Internet reliability → Engagement	β = 0.28	0.003	[0.10, 0.46]	Significant
H4	Device affordability × Digital infrastructure → Engagement	β = 0.22 (interaction)	0.008	[0.06, 0.38]	Significant
H5	Adoption → Self-discipline → Persistence	β = 0.075 (indirect)	0.004	[0.03, 0.12]	Partial mediation
H6	Adoption × Perceived usefulness → Persistence	β = 0.45 (high PU) vs. 0.10 (low PU)	0.001 (index)	[0.20, 0.70]	Significant moderation

Notes: Table 1 presents the results of the six hypotheses (H1–H6), each of which demonstrated statistical significance.

Table 1 shows that instructor accessibility was the best predictor of online learning adoption (β = 0.35, *p* < 0.01). This means that students who perceive their instructors as more accessible are more likely to use e-learning. At the same time, LMS design had an indirect effect on adoption through student satisfaction (β = 0.18, *p* = 0.002). This means that even though system usability alone may not lead to adoption, it does make students happier, which in turn leads to more engagement.

Furthermore, internet reliability had a direct, moderate effect on engagement (β = 0.28, *p* = 0.003), which shows how important it is to have stable connectivity to keep people involved. Notably, device affordability moderated this relationship (interaction β = 0.22, *p* = 0.008): students with better device access showed stronger engagement gains from improved infrastructure.

Lastly, self-discipline partially mediated the link between adoption and persistence (β = 0.075, *p* = 0.004), meaning that students who adopted e-learning were more persistent if they were good at controlling themselves. Furthermore, perceived usefulness enhanced the influence of adoption on persistence (β = 0.45 for high-PU students compared to β = 0.10 for low-PU, *p* < 0.01). This suggests that motivational interventions, such as emphasizing the career relevance of e-learning, may enhance persistence, particularly among learners with lower self-discipline.

Research Question 2

Research Questions 2a

What are the perceptions and lived experiences of Malaysian distance learners that influence their adoption of ODL? The data indicate that institutional support is highly beneficial for engaging learners and supporting their success in ODL. However, it is also crucial to address issues related to online systems and administrative procedures in order to enhance the overall learner experience. Institutions that offer effective, timely, and comprehensive support help reduce barriers and improve outcomes in online distance learning settings.

Mixed Experiences With Institutional Support

Positive feedback demonstrates the motivational impact of mentoring sessions and the benefits of structured guidance. One female student (F4) from a middle-class family said, "Step-by-step help made online learning possible." But another male student (M5) from a middle-class family said, "Study materials are often late and hard to find." This male student pointed out that people are becoming frustrated with logistical problems, such as delays and insufficient study materials being available.

The duality reveals that people value direct instructional support, but it also highlights that resources aren't always easily accessible, which suggests that institutions need to be more consistent and reliable in their support.

Research Question 2b

How do disparities in digital infrastructure affect urban online learners in their ODL experiences, and what solutions do they propose? The findings reveal that distance learners encounter significant technological challenges; however, institutional flexibility,

technical support, and targeted aid can help create a more equitable and effective online learning environment.

Technological Obstacles and Adaptive Approaches

Students encounter challenges with infrastructure (such as unreliable internet), but they are actively seeking alternative solutions, which demonstrates their resilience in the face of digital inequality. A middle-class man (M7) who took part in the study said, "Sometimes the internet connection at home is so slow... I missed the deadline. For important classes or submissions, I go to public places or friends' houses that have better internet.

Social Capital as a Lifeline in Online Learning

Peer and community networks become essential safety nets, effectively filling in the gaps where institutional support or personal funds are lacking. These informal networks provide valuable practical solutions, enabling individuals to continue participating in online education. To exemplify, one female participant (F3) from high incomes said that when her home internet went down, she relied on other places to connect, saying, "I go to public spaces or friends' homes." This strategy demonstrates how social capital facilitates access to essential infrastructure. Another one female participant (F6) also discussed how sharing devices with people in her personal network helped her bridge the technology gap. She said, "I borrow laptops or devices from family..." This indicates that relationships with others can be a crucial, informal resource for students who may struggle to learn online due to financial constraints.

Research Question 2c

What strategies do learners employ to maintain motivation and self-discipline in self-paced ODL environments? The findings indicate that Malaysian ODL learners maintain engagement and discipline through a combination of intrinsic motivation, structured habits, social accountability, and proactive coping strategies, which enable them to overcome challenges and sustain success in online distance learning.

Social Support as a Way to Get Things Done

Learners rely on relationships with others, such as friends, peers, and tutors, to stay motivated and accountable. This illustrates the significance of community in combating loneliness and maintaining focus while learning online. One male participants (M8) with middle incomes said, "My study group reminds me to keep up—we check in on each other, and when I felt like giving up...I'd talk to my tutor... Also, talking to friends helped."

Driven by Intrinsic and Extrinsic Goals Discipline

Structured self-regulation (such as planners) and aspirational goals (like family pride or career advancement) both contribute to intrinsic discipline. This mix of intrinsic (personal organization) and extrinsic (social/future rewards) motivators makes people more committed to learning. One female participant (F7) from high income family said, "I use a planner. " Similarly, another female (F1) mentioned that "I want to make my parents proud and get a better job in the future."

Integration of Data

The quantitative and qualitative data in this study offer complementary and mutually reinforcing insights into the Malaysian ODL experience. The robust quantitative correlation between instructor accessibility and adoption (β = 0.35) is clearly demonstrated through qualitative narratives of students appreciating incremental guidance and mentorship. The quantitative data indicated that internet reliability significantly influenced engagement (β = 0.28), while the qualitative findings supported this statistic through students' accounts of difficulties with slow connections and their pursuit of public Wi-Fi.

Based on the mixed-methods analysis, table 2 below synthesizes the quantitative results with the specific qualitative narratives that support each finding. This approach illustrates not just the statistical significance, but the "lived experiences" of the Malaysian distance learners.

Table 2
Summary of Findings: Quantitative Hypotheses & Qualitative Support

Research Question / Hypothesis	**Statistical Finding**	**Qualitative Support / Lived Experience**
RQ1a / H1: Instructor Accessibility	**Significant** (beta = 0.35, p < 0.01)	Learners noted that "step-by-step help made online learning possible," emphasizing the motivational impact of mentoring.
RQ1a / H2: LMS Design - Satisfaction	**Significant** (beta = 0.18, p = 0.002)	While usability improves satisfaction, inconsistencies like "late and hard to find" study materials cause logistical frustration.
RQ1b / H3: Internet Reliability	**Significant** (beta = 0.28, p = 0.003)	Students reported missing deadlines due to slow home connections, forcing them to seek internet in public places or friends' houses.
RQ1b / H4: Device Affordability	**Significant** (beta = 0.22, p = 0.008)	Learners bridge the "technology gap" by borrowing laptops or devices from family members due to financial constraints.
RQ1c / H5: Self-Discipline	**Significant** (beta = 0.075, p = 0.004)	Discipline is maintained through structured habits, such as using

		planners and maintaining study groups for accountability.
RQ1c / H6: Perceived Usefulness	**Significant** (beta = 0.45 for High PU)	Persistence is driven by aspirational goals, such as the desire to "get a better job" or "make parents proud".

Discussion

Quantitative Data

The findings of this study provide essential insights into the determinants that affect ODL adoption and retention among Malaysian students. The descriptive statistics indicated that institutional support factors, such as instructor accessibility (M = 3.82, SD = 0.91) and LMS usability (M = 3.45, SD = 1.12), received moderate ratings. However, there was considerable variability within the sample, especially regarding perceptions of administrative policy support (M = 3.20, SD = 1.05). These findings are consistent with previous research by Fang et al. (2022), which indicates that although Malaysian institutions have made advances in digital education infrastructure, discrepancies in implementation continue to pose a challenge.

The path analysis conducted in this study produced three significant findings that enhance the comprehension of success factors in ODL. Initially, instructor accessibility was identified as the most significant predictor of adoption ($\beta = 0.35$, $p < .01$), thereby validating H1. This substantial effect size underscores its specific relevance in the Malaysian context, where cultural values prioritize teacher-student relationships. Second, the validated mediating effect of self-discipline ($\beta = 0.075$, 95% CI (0.03, 0.12)) on the adoption-persistence relationship (H5) enhances Kumar et al.'s (2021) self-regulation theory by quantifying its significance in Southeast Asian ODL contexts. Third, the substantial interaction between device affordability and digital infrastructure ($\beta = 0.22$, $p < .01$) for H4 highlights a critical equity issue: infrastructure investments yield optimal returns only when students have sufficient access to hardware.

The moderation findings present particularly innovative contributions. The conditional effect of perceived usefulness ($\beta = 0.45$ for high-PU vs. 0.10 for low-PU learners) not only corroborates H6 but also indicates that motivational interventions may mitigate technological constraints. This aligns with Alamri et al.'s (2020) studies, but it extends their findings by demonstrating how perceived value interacts with system characteristics in developing countries. The LMS satisfaction mediation ($\beta = 0.18$) identified for H2 indicates that enhancements in usability indirectly influence adoption via affective pathways, a distinction absent in solely behavioral models of technology acceptance.

Qualitative Data

The findings highlight that institutional support plays a pivotal role in shaping Malaysian distance learners' adoption of ODL, but its inconsistent delivery creates barriers. While mentoring and structured guidance motivate learners, delays in materials and

administrative inefficiencies reduce trust and engagement. This findings resonate with Hartnett (2019) and Pedrotti (2016), that institutions must not only provide supportive practices but also ensure reliable systems to sustain positive learning experiences as.

Disparities in digital infrastructure continue to challenge learners, even in urban contexts. Students often rely on public spaces, friends, or shared devices to overcome internet and technology limitations, reflecting the importance of social capital as a safety net. These adaptive strategies highlight resilience but also reveal inequities that institutions must address through flexible policies, technical support, and targeted aid. Recognizing and leveraging community-based networks could further strengthen institutional support systems.

Learners' ability to sustain motivation in self-paced ODL relies on both intrinsic and extrinsic strategies. Study groups, tutors, and peer accountability provide vital social support, while planners and aspirational goals foster discipline and persistence. This mix of personal organization and collective encouragement align with Chiu (2021), that motivation in ODL is multidimensional. To enhance outcomes, institutions should design environments that integrate reliable academic support, equitable infrastructure access, and opportunities for community engagement.

Conclusion and Implications

This mixed-methods study definitively establishes that effective ODL in Malaysia relies on three interconnected pillars: substantial institutional support, equitable digital infrastructure, and robust psychological supports. Quantitative analysis revealed that instructor support was the most significant predictor of adoption ($\beta = 0.35$) and perceived usefulness was crucial for persistence ($\beta = 0.45$). Concurrently, qualitative findings illustrated how students ingeniously address systemic challenges via peer networks and adaptive strategies. The convergence of findings emphasizes that technological investments alone are inadequate; optimal outcomes in ODL necessitate concurrent focus on pedagogical quality, equitable infrastructure, and learner motivation strategies. There is an urgent need to address rural-urban disparities and administrative bottlenecks to establish a genuinely inclusive digital learning ecosystem.

To encourage more people to use and enjoy online learning, universities should require their teachers to hold regular virtual office hours (such as 2–3 times a week) and provide them with training on how to communicate in a helpful and personal manner. This method is effective, as demonstrated by a Malaysian school that achieved a 20% increase in completion rates after holding Q&A sessions every other week. At the same time, schools need to make LMSs easier to use by adopting mobile-first designs, simplifying navigation with one-click access and color-coded deadlines, and gamifying engagement. This strategy has been shown to cut helpdesk tickets at universities by 40% after redesign. These actions focus on two important factors that affect the success, including the presence of the instructor ($\beta = 0.35$) and the ease of use of the LMS ($\beta = 0.18$).

To address digital inequality, schools and telecommunications companies should collaborate to offer discounted student broadband plans and expand device loan programs. They should also offer offline options for areas with poor connectivity, which is important

because internet reliability has a big effect (β = 0.28) and device affordability has a small effect (β = 0.22). To improve self-discipline (β = 0.075) and motivation (β = 0.45), universities should incorporate time-management training, utilize automated nudges, and demonstrate the relevance of careers through alumni webinars and micro-credentials. This is similar to how digital universities' successful mentor program cut dropouts by 15%. These two strategies address both gaps in infrastructure and mental blocks that prevent people from sticking with something. A vital direction for future research involves the implementation of AI-driven tutoring systems to enhance personalized learning in Malaysian distance education.

The study concludes that the successful adoption and long-term academic persistence of Online Distance Learning (ODL) in Malaysia are fundamentally driven by an interconnected triad of institutional, technological, and psychological pillars. Quantitative evidence identifies instructor accessibility as the primary determinant for initial adoption (beta = 0.35), while perceived usefulness and self-discipline serve as critical mediators that transform initial use into sustained engagement (Bohari et al., 2025). Methodologically, the research demonstrates that qualitative data "elucidates the contextual foundations" of these statistical patterns, revealing how learners navigate systemic barriers—such as unreliable internet and administrative inefficiencies—through social capital and informal peer networks (Lakulu et al., 2025). Consequently, pedagogical strategies must prioritize "teaching presence" through regular virtual interaction, while policy-level interventions must address the "digital divide" by synchronizing infrastructure investment with device affordability to foster a truly inclusive digital education ecosystem. (refer Table 3).

Table 3
Research Implications for ODL Adoption and Persistence

Type of Implication	**Summary of Finding**	**Proposed Action / Practical Implication**
Pedagogical	Instructor accessibility is the strongest predictor of adoption (beta = 0.35).	Universities should mandate regular virtual office hours and train educators in "personal communication" to maintain strong teacher-student relationships.
Methodological	Qualitative data "elucidated the contextual foundations" of quantitative statistical patterns.	Future educational research should prioritize **mixed-methods triangulation** to connect "what" is happening (adoption rates) with "why" (behavioral patterns).
Technological & Policy	Internet reliability (beta = 0.28) and device affordability (beta = 0.22) significantly impact engagement.	Institutions and telcos should collaborate on **discounted broadband** and device loan programs to bridge the "digital divide" between rural and urban learners.

This mixed-methods study concludes that the successful adoption and long-term academic persistence of ODL in Malaysia are fundamentally driven by an interconnected triad of institutional, technological, and psychological pillars. Quantitative evidence identifies instructor accessibility as the primary determinant for initial adoption, while perceived usefulness and self-discipline serve as critical psychological mediators that transform initial use into sustained engagement. Qualitatively, the research uncovers a high degree of student resilience, where learners leverage social capital and informal peer networks to navigate systemic barriers such as unreliable internet and administrative inefficiencies. Ultimately, the findings highlight that technological investment alone is insufficient; institutions must urgently synchronize pedagogical quality with equitable infrastructure access and targeted motivational supports to bridge the rural-urban divide and foster a truly inclusive digital education ecosystem in Malaysia.

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