Integrating Technology Acceptance Model and Cognitive Load Theory to Predict Student Deadline Adherence in Centralized Learning Hubs: A Conceptual Framework

***Hafini Suhana Ithnin[1], Noormahayu Mohd Nasir[2], Nor Zarina Mohd Salim[3], Murzidah Ahmad Murad[4]**

[1,2,3]Faculty of Business and Management, Universiti Teknologi MARA Perak Branch, Malaysia

[4]Universiti Teknikal Malaysia Melaka

***Corresponding Author**

DOI: https://doi.org/10.47772/IJRISS.2026.101000097

Received: 12 October 2026; Accepted: 17 October 2026; Published: 30 October 2026

ABSTRACT

In contemporary higher education, the rapid proliferation of disjointed digital platforms ranging from institutional Learning Management Systems (LMS) to emails, messaging applications, and cloud storage folders creates a fragmented learning environment. This information fragmentation imposes severe extraneous cognitive load on students, resulting in task initiation friction, misplaced assessment instructions and compromised submission timelines. Addressing this operational challenge, this paper proposes an integrated conceptual framework synthesizing the Technology Acceptance Model (TAM) and Cognitive Load Theory (CLT) to evaluate student deadline compliance within a Centralized Learning Hub (CLH). The framework structures three distinct Independent Variables (IVs) which are Material Cognitive Load Reduction (MCLR), Perceived Ease of Link Access (PELA) and Perceived Task & Rubric Clarity (PTRC). While the dependent variable (DV) measures how well students meet deadlines (Student Deadline Adherence, SDA). This paper bridges the literature gap between platform design, cognitive preservation, and academic compliance, providing educators and instructional designers with an actionable, empirically testable framework to optimize digital course architecture.

Keywords: Centralized Learning Hub, Technology Acceptance Model, Cognitive Load Theory, Student Deadline Adherence, Information Architecture, Higher Education.

1. INTRODUCTION

In the contemporary landscape of higher education, the rapid proliferation of digital learning tools has inadvertently created a complex ecosystem of fragmented information (Instructure, 2024). While students now have unprecedented access to educational materials, these resources are frequently scattered across multiple, disjointed platforms that ranging from formal institutional Learning Management Systems (LMS) and university emails to informal messaging applications and disparate cloud storage links (Pathify, 2025 and Sweller, 2024). Consequently, modern university students face a significant logistical challenge in managing their learning resources. Instead of dedicating their working memory to comprehending academic content, students often expend substantial cognitive effort navigating this fragmented digital environment merely to locate lecture notes, assignment rubrics, and submission portals (De Koning, 2024 and Pathify, 2025).

This structural fragmentation presents a critical problem for both academic achievement and instructional efficiency. The reliance on dispersed communication channels leads to high operational friction and extraneous cognitive load (Guzmán & Zambrano, 2024 and Sweller, 2024). According to Pathify (2025) students routinely overlook critical assessment guidelines, misplace submission links, and struggle to adhere to deadlines with nearly half of higher education students reporting missed deadlines due to platform siloation Furthermore, this systemic disorganization

generates significant administrative overhead for instructors. A disproportionate amount of instructional time is consumed by addressing repetitive, low-level student inquiries regarding the whereabouts of basic course materials and submission protocols (Instructure, 2024).

To address these systemic inefficiencies, there is a pressing need to consolidate course deliverables into a unified digital architecture. Therefore, the purpose of this study is to propose and conceptualize the implementation of a Centralized Learning Hub (CLH) as a single-point-of-access learning platform designed to eliminate information scattering. By centralizing lecture materials, assessment guidelines, and submission portals into a highly accessible hub, this initiative aims to reduce navigational friction and directly enhance academic execution (Davis, 1989 and Pathify, 2025).

Unlike broad e-learning studies that evaluate general system adoption, this paper isolates specific structural dimensions of the hub to predict a concrete behavioural outcome which is Student Deadline Adherence (SDA). Guided by this focus, the study establishes the following research questions:

1. Does Material Cognitive Load Reduction (MCLR) significantly influence Student Deadline Adherence (SDA)?
2. Does Perceived Ease of Link Access (PELA) significantly influence Student Deadline Adherence (SDA)?
3. Does Perceived Task & Rubric Clarity (PTRC) significantly influence Student Deadline Adherence (SDA)?

To address these questions, the study sets the following objectives:

1. To examine the effect of Material Cognitive Load Reduction (MCLR) on Student Deadline Adherence (SDA).
2. To evaluate the effect of Perceived Ease of Link Access (PELA) on Student Deadline Adherence (SDA).
3. To investigate the effect of Perceived Task & Rubric Clarity (PTRC) on Student Deadline Adherence (SDA).

2. THEORETICAL LITERATURE

To develop a theoretically grounded conceptual framework, this study draws on the Technology Acceptance Model (TAM) and Cognitive Load Theory (CLT), while incorporating insights from self-regulated learning (SRL) literature. TAM provides a foundation for explaining how students perceive the ease and usefulness of digital learning features, whereas CLT helps explain how the organization and accessibility of digital learning materials may influence the mental effort required to complete academic tasks. In addition, SRL offers a complementary perspective on how students plan, monitor, and manage their learning activities. Although these perspectives address different aspects of the learning process, their integration provides a broader basis for understanding how digital learning environments can support students in completing academic assignments effectively.

2.1.1 TAM in Relation to Self-Regulated Learning

Although the Technology Acceptance Model (TAM) explains students' perceptions of technology, self-regulated learning (SRL) provides an additional perspective on how students manage their academic tasks. SRL refers to the processes through which learners actively plan, monitor, and regulate their learning to achieve academic goals. In assignment-based learning, these processes may involve identifying assessment requirements, planning task completion, monitoring progress against marking criteria, and ensuring that assignments are submitted through the appropriate channels.

Recent research has increasingly examined the relationship between digital learning environments and the measurement of SRL. Alhazbi et al. (2024), in a systematic review of empirical studies in higher education, examined how learning analytics can be used to identify indicators of students' self-regulated learning. Their findings highlighted the use of online activity data to examine learning behaviours, including time management, engagement, regularity, and procrastination-related behaviours. In addition, de Barba et al. (2025) developed and validated a learning analytics rubric for measuring SRL within learning management systems (LMS). Their study identified indicators related to reviewing learning content, following study schedules, pacing learning, and reading assessment instructions. Together, these

studies demonstrate the potential of digital learning environments to provide insights into students' task-management and learning behaviours, while also highlighting the importance of theoretically grounded measures when interpreting students' online activities.

The connection between SRL and the present framework lies in the role of digital accessibility and assessment information in supporting students' learning activities. For example, students who can locate submission links easily may spend less time searching for the appropriate submission location. Similarly, students who can readily access clear instructions and marking rubrics may find it easier to plan their work and monitor whether their assignments meet the stated requirements. These relationships are theoretically plausible because access to relevant information and clear task expectations may support students' planning and monitoring processes. However, ease of access and rubric clarity should not be treated as direct measures of SRL. Rather, they represent characteristics of the digital learning environment that may facilitate students' task-management processes.

Integrating SRL into the theoretical discussion therefore strengthens the rationale for examining Perceived Ease of Link Access (PELA) and Perceived Task and Rubric Clarity (PTRC). While TAM explains students' perceptions of digital functionality, SRL helps explain why these functional characteristics may matter for assignment planning, monitoring, and completion. This complementary perspective is particularly relevant to the present study because its focus extends beyond students' acceptance of educational technology to consider how the design and presentation of assignment-related information may facilitate academic task execution. Nevertheless, whether these characteristics improve students' actual assignment submission behaviour remains a proposition that requires further investigation.

2.1.2 Justification for Selecting TAM over Alternative Adoption Models

Although TAM provides a suitable starting point for examining students' perceptions of digital learning features, other theoretical models can also explain technology use in higher education. Two relevant alternatives are the Unified Theory of Acceptance and Use of Technology (UTAUT) and the DeLone and McLean Information Systems Success Model. Comparing these models is important because the selection of a theoretical foundation should reflect its suitability for the research objectives rather than its popularity alone.

The UTAUT model, developed by Venkatesh et al. (2003), explains technology acceptance through four principal determinants: performance expectancy, effort expectancy, social influence, and facilitating conditions. Compared with TAM, UTAUT provides a broader perspective by considering social and organizational influences alongside users' expectations about system performance and effort. Its relevance to higher education is supported by Xue et al. (2024), whose systematic review examined 162 studies applying UTAUT in higher education. Their findings demonstrated the model's widespread application across different educational technologies and highlighted the importance of context-specific approaches to understanding technology adoption. Nevertheless, the breadth of UTAUT may be less necessary when the principal objective is to examine two specific functional characteristics of digital assignment environments. Unless social influence, institutional support, or facilitating conditions form part of the research questions, applying the full UTAUT model may expand the framework beyond its immediate conceptual purpose.

The DeLone and McLean Information Systems Success Model provides another relevant perspective. The updated model emphasizes six dimensions: system quality, information quality, service quality, system use, user satisfaction, and net benefits (DeLone & McLean, 2003). Unlike TAM, which focuses on users' perceptions and acceptance of technology, the Information Systems Success Model offers a broader assessment of system quality and the outcomes associated with information system use. Al-Nuaimi and Al-Emran (2021), in their systematic review of learning management systems, identified TAM, UTAUT, and the DeLone and McLean Information Systems Success Model among the prominent theoretical approaches used in LMS research. Furthermore, Al-Adwan et al. (2021) developed a holistic e-learning success model that integrated information systems success and technology acceptance perspectives. These studies demonstrate that both technology acceptance and information system quality are relevant to understanding educational technology outcomes.

However, the Information Systems Success Model is not the primary choice for the present study because the proposed framework focuses on students' perceptions of specific assignment-related functions rather than a comprehensive evaluation of system quality, service quality, user satisfaction, and overall system success. Although PELA has conceptual connections with system usability and PTRC has connections with information quality, neither construct should be considered identical to those broader dimensions. Instead, they represent more narrowly defined, task-specific perceptions intended to capture students' experiences when accessing submission facilities and interpreting assignment requirements.

Taken together, the comparison suggests that TAM offers a focused theoretical starting point for this conceptual framework. Its perceived ease-of-use and perceived usefulness dimensions provide a basis for examining students' perceptions of link accessibility and the practical value of clear assignment information. UTAUT and the Information Systems Success Model remain valuable alternatives, but their broader emphasis on social influences, institutional conditions, service quality, and overall system success extends beyond the immediate focus of the proposed framework. Accordingly, this study adopts TAM as its primary technology acceptance perspective, uses SRL literature to explain the relevance of digital features to students' academic task management, and draws on Cognitive Load Theory (CLT) to examine the potential cognitive implications of unnecessary navigation and unclear assessment information.

This theoretical positioning does not imply that TAM is universally superior to alternative models. Rather, it reflects the alignment between the study's research focus and TAM's core concepts. By contextualizing perceived ease of use as PELA and using perceived usefulness as a theoretical basis for developing PTRC, the study proposes a task-specific interpretation of technology acceptance in higher education. The conceptual contribution lies in examining whether these distinct characteristics of digital assignment environments provide a useful explanation of students' assignment-related behaviour. Their proposed relationships with cognitive load and Student Deadline Adherence (SDA), however, require further theoretical specification and empirical validation.

2.2 Cognitive Load Theory (CLT)

Formulated by John Sweller, Cognitive Load Theory (CLT) explains that human working memory has a limited capacity for processing new information (Sweller, 2024). CLT categorizes mental load into three types consisting of Intrinsic Load, Germane Load and Extraneous Load. Intrinsic load refers to the inherent complexity of the academic content itself. Germane load involves productive mental processing dedicated to constructing schemas and facilitating deep learning. In contrast, extraneous load refers to unproductive mental processing resulting from poor instructional presentation, complex navigation, or disorganized information structures (De Koning, 2024).

When learning resources, rubrics, and submission channels are scattered across detached platforms, students experience high extraneous cognitive load due to the split-attention effect (Guzmán & Zambrano, 2024). Searching across folders drains working memory capacity before the student even initiates the academic task. In this framework, Material Cognitive Load Reduction (MCLR) represents the structural design dimension of the hub that minimizes the cognitive load by consolidating notes into a flat, zero-click layout.

3. Conceptual Framework and Hypotheses Development

3.1 Diagrammatic Model

This study proposes the Material, Access and Clarity–Deadline Adherence (MAC-DA) Framework to explain how specific characteristics of a Centralized Learning Hub may influence students' adherence to academic assignment deadlines. The acronym MAC-DA represents the three principal dimensions of the proposed framework: Material refers to the organization of learning materials, Access refers to the accessibility of assignment submission links, and Clarity refers to the transparency of assignment instructions and assessment rubrics. The suffix DA, which stands for Deadline Adherence, represents the dependent variable, Student Deadline Adherence (SDA).

The MAC-DA Framework is conceptually grounded in the Technology Acceptance Model (TAM) and Cognitive Load Theory (CLT). TAM provides the theoretical basis for examining students' perceptions of the accessibility and usefulness

of digital learning features, while CLT explains how the organization and presentation of information may influence the cognitive demands associated with academic tasks. Drawing on these complementary perspectives, the MAC-DA Framework proposes that material organization, link accessibility, and task and rubric clarity represent distinct characteristics of the digital learning environment that may be associated with students' assignment submission behaviour.

Specifically, the framework comprises three independent variables: Material Cognitive Load Reduction (MCLR), Perceived Ease of Link Access (PELA), and Perceived Task and Rubric Clarity (PTRC). These constructs represent the material, access, and clarity dimensions, respectively. Student Deadline Adherence (SDA) serves as the dependent variable, representing students' behavioural compliance with stipulated assignment submission deadlines. The framework proposes direct relationships between each of the three independent variables and SDA. Through these relationships, the MAC-DA Framework provides a task-specific conceptual approach to examining how the design of a centralized digital learning environment may relate to students' deadline adherence as shown in Figure 3.1 below.

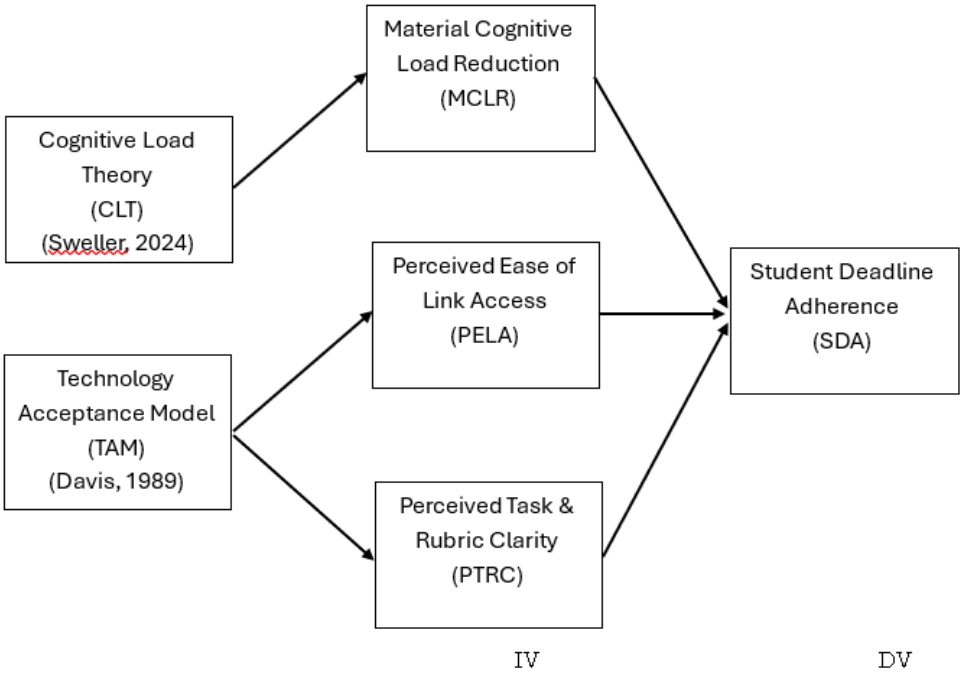

Figure 3.1: Material, Access and Clarity – Deadline Adherence (MAC-DA) Framework

3.2 Operational Definitions of Constructs

The MAC-DA Framework comprises three independent variables and one dependent variable. Each construct represents a distinct dimension of the centralized digital learning environment or the academic behaviour under investigation. The following operational definitions establish the conceptual boundaries of each construct and clarify its role within the MAC-DA Framework.

Within the MAC-DA Framework, Material Cognitive Load Reduction (MCLR) represents the material dimension. It is operationally defined as the extent to which students perceive course materials and lecture slides to be concisely and centrally organized. In particular, this construct focuses on the organization and accessibility of learning materials, thereby minimizing the need to navigate across multiple screens or search through fragmented resources. From the perspective of CLT, such arrangements may reduce unnecessary cognitive demands associated with locating and processing relevant information, allowing students to direct greater attention towards their academic tasks.

While Perceived Ease of Link Access (PELA) represents the access dimension of the MAC-DA Framework. It refers to the degree to which students perceive assignment submission portals as readily accessible without having to navigate

through deeply nested folder structures or multiple pages. This construct emphasizes the perceived effort required to locate and access the appropriate submission links within the centralized learning hub. Drawing on the perceived ease-of-use principle of TAM, PELA focuses on the accessibility of a specific digital function rather than the general usability of the entire learning management system. Easier access may reduce the operational effort associated with locating submission facilities and support students in managing their assignment-related activities.

Meanwhile Perceived Task and Rubric Clarity (PTRC) represent the clarity dimension of the MAC-DA Framework. It is defined as the degree to which students perceive assignment instructions, assessment criteria, submission schedules, and marking rubrics within the learning hub as transparent, readily accessible, and easy to understand. This construct focuses on the availability and comprehensibility of information required to complete and submit academic assignments. In relation to TAM, PTRC draws on the perceived usefulness principle by considering how clearly presented assessment information may support students' understanding and execution of academic tasks. From a cognitive perspective, clear instructions and assessment criteria may also reduce unnecessary effort associated with interpreting assignment requirements. Nevertheless, PTRC is a context-specific construct informed by TAM rather than a direct equivalent of perceived usefulness.

Although Student Deadline Adherence (SDA) is the dependent variable in the MAC-DA Framework. It refers to students' behavioural compliance with stipulated academic assignment deadlines, particularly their punctuality in completing and submitting assignments within the prescribed time frame. This construct emphasizes observable deadline-related behaviour rather than students' intentions to use a learning management system or their general satisfaction with digital learning technologies. Within the MAC-DA Framework, SDA provides the outcome through which the proposed relationships involving MCLR, PELA, and PTRC can be examined.

Taken together, the four constructs establish the conceptual structure of the MAC-DA Framework. MCLR, PELA, and PTRC represent the material, access, and clarity dimensions of the centralized learning hub, respectively, whereas SDA represents the academic behavioural outcome. By integrating TAM and CLT as complementary theoretical foundations, the framework proposes that the design and presentation of digital learning features may be relevant to students' ability to manage assignment-related activities and adhere to submission deadlines. These proposed relationships form the basis for the hypotheses developed in the subsequent sections.

Despite its theoretical grounding in the Technology Acceptance Model (TAM) and Cognitive Load Theory (CLT), the MAC-DA Framework remains a proposed conceptual model that has not yet been empirically tested. Therefore, the hypothesized relationships between Material Cognitive Load Reduction (MCLR), Perceived Ease of Link Access (PELA), Perceived Task and Rubric Clarity (PTRC), and Student Deadline Adherence (SDA) should be interpreted as theoretically informed propositions rather than established empirical relationships. Furthermore, students' deadline adherence may be influenced by other factors not included in the framework, such as motivation, time-management skills, workload, and personal circumstances. Future empirical research is therefore necessary to validate the proposed constructs, examine the hypothesized relationships, and assess the framework's explanatory power across different higher education contexts. Such validation would help establish the applicability and potential contribution of the MAC-DA Framework to understanding students' assignment submission behaviour.

3.3 Hypotheses Development

The positive influence of Material Cognitive Load Reduction (MCLR) on Student Deadline Adherence (SDA) is grounded in the cognitive preservation mechanism of Cognitive Load Theory (Sweller, 2024). Extraneous cognitive load generated by complex, multi-platform search environments has been shown to deplete working memory and impair self-regulatory control (Costley & Lange, 2021; Paas & van Merriënboer, 2020). When digital instructional materials are scattered across disjointed channels, the mental effort expended during the search phase creates task initiation friction, which triggers academic procrastination and temporal task delay (Mutlu-Bayraktar et al., 2022; Rabin et al., 2020). Conversely, reducing extraneous load through flat, centralized resource aggregation preserves executive functioning, allowing students to deploy their cognitive resources toward task planning and deadline monitoring

(Bannert et al., 2015; Broadbent, 2017). By eliminating navigational friction and cognitive fatigue, the Centralized Learning Hub facilitates timely task initiation, leading directly to higher submission punctuality.

Therefore, hypothesis for MCLR factor support as below:

*H1***:** *Material Cognitive Load Reduction (MCLR) has a significant positive effect on Student Deadline Adherence (SDA).*

Based on the Technology Acceptance Model (TAM) and Human-Computer Interaction (HCI) frameworks, Perceived Ease of Link Access (PELA) helps reduce difficulties in accessing links and makes it easier for students to complete tasks in digital learning environments (Davis, 1989; Norman, 2013). Within TAM, Perceived Ease of Use posits that when a system removes navigational barriers and physical clicks, user engagement and task follow-through substantially increase (Almusharraf, 2024; Venkatesh & Bala, 2008). In traditional LMS structures, embedding submission portals inside deeply nested folder hierarchies introduces high interaction costs and friction costs ("sludge"), which disincentivize immediate action and induce last-minute submission procrastination (Almaiah et al., 2020; Sunstein, 2021). Behavioural research indicates that even minor operational hurdles disproportionately diminish student compliance with deadline-sensitive academic deliverables (Castleman & Page, 2015; You, 2016). Conversely, the Centralized Learning Hub implements spatial-temporal co-location by placing direct submission links immediately adjacent to weekly lecture materials and guidelines. This structural simplification eliminates navigational search depth, lowers task initiation barriers, and enables frictionless submission workflows, directly fostering timely completion.

Therefore, the hypothesis on PELA factor was described as below:

H2: Perceived Ease of Link Access (PELA) has a significant positive effect on Student Deadline Adherence (SDA).

Grounded in the Technology Acceptance Model (TAM) and Self-Regulated Learning (SRL) frameworks, Perceived Task & Rubric Clarity (PTRC) acts as an essential cognitive driver of behavioural compliance (Davis, 1989; Zimmerman & Schunk, 2021). Within the TAM paradigm, platform usefulness is demonstrated when centralized systems provide high task utility and transparent expectations that directly facilitate academic execution (Basyah et al., 2025). Furthermore, Temporal Motivation Theory (Steel, 2007) identifies instructional ambiguity and vague assessment parameters as key causes of academic procrastination and missed deadlines. When assignment rubrics, formatting guidelines, and grading criteria are scattered or poorly specified, students experience evaluative anxiety and task aversion, causing them to postpone task initiation (Corkin et al., 2014; Panadero & Jonsson, 2013). Conversely, making assessment rubrics and submission instructions transparently accessible within a Centralized Learning Hub eliminates instructional ambiguity and provides clear evaluative standards (Andrade & Du, 2005; Reddy & Andrade, 2010). This clarity allows students to engage in proactive planning, monitor their workflow progress, and allocate their time effectively, directly translating into higher submission punctuality (Wolters et al., 2017). Therefore, it is hypothesized that:

H3: Perceived Task & Rubric Clarity (PTRC) has a significant positive effect on Student Deadline Adherence (SDA).

4. Conceptual Gap

Learning Management Systems (LMS) have become an integral component of higher education, supporting the distribution of learning materials, communication between lecturers and students, and the management of academic assessments. Despite the extensive literature on educational technology adoption and digital learning environments, several conceptual gaps remain in explaining how specific LMS design characteristics may influence students' academic behaviours. In particular, three areas warrant further investigation which are the limitations of technology acceptance research in mandatory use environments, the insufficient integration of cognitive load and technology acceptance perspectives and the limited examination of individual interface features in relation to students' academic outcomes.

First, existing technology acceptance research has predominantly emphasized users' perceptions, behavioural intentions, and technology usage as indicators of system acceptance. The Technology Acceptance Model (TAM), for example, explains technology acceptance through perceived ease of use and perceived usefulness (Davis, 1989). Subsequent

extensions, including the work of Venkatesh and Bala (2008), have further developed the model to explain the determinants of technology acceptance. However, these approaches may provide an incomplete explanation of students' experiences in higher education environments where LMS use is often institutionally required. Students may continue using an LMS to access course materials, obtain assessment information, and submit assignments regardless of whether they perceive the system as convenient or satisfactory. Consequently, continued usage or behavioural intention alone may not adequately reflect the extent to which an LMS facilitates students' academic responsibilities. This limitation highlights the need to examine behavioural outcomes that are directly relevant to academic task completion, particularly Student Deadline Adherence (SDA), which concerns students' compliance with assignment submission deadlines. By shifting the focus from technology acceptance alone towards deadline-related behaviour, the present study seeks to extend the discussion of educational technology beyond system usage to the potential contribution of digital learning environments to students' academic task management.

Second, the relationship between interface design, cognitive demands, and students' perceptions of technology remains insufficiently integrated within the proposed research context. Cognitive Load Theory (CLT) explains that working memory has limited capacity and that unnecessary cognitive demands may interfere with learning and task performance (Sweller, 2024). In parallel, technology acceptance research examines how users' perceptions of ease of use and usefulness influence their responses to technological systems (Davis, 1989). Although these perspectives address complementary aspects of human interaction with technology, examining them separately may provide an incomplete understanding of students' experiences when completing assignments through digital platforms. For example, complex navigation structures, fragmented learning materials, and difficult-to-locate submission links may require students to expend additional mental effort before they can engage with the intended academic task. Similarly, unclear assignment instructions or inaccessible assessment rubrics may increase the effort required to interpret task requirements and plan appropriate responses. These examples suggest that the design of digital learning environments may have implications for both perceived usability and the cognitive demands associated with academic task management. Nevertheless, the precise relationships between these factors and students' deadline adherence should not be assumed without further investigation. Accordingly, the present study proposes a framework that examines Material Cognitive Load Reduction (MCLR), Perceived Ease of Link Access (PELA), and Perceived Task and Rubric Clarity (PTRC) as distinct characteristics of the digital learning environment that may help explain variations in SDA.

Third, existing research on educational technology frequently evaluates LMS adoption, usability, or effectiveness at the system level, potentially overlooking the contribution of individual interface characteristics to students' academic behaviours. Although platform-level evaluations are valuable for comparing broad system capabilities, they may not identify which specific design features facilitate or obstruct students' completion of academic tasks. Students interact with an LMS through numerous functional elements, including the organization of learning materials, the accessibility of assignment submission links, and the presentation of assessment instructions and marking rubrics. These elements represent distinct aspects of the digital learning experience and may influence task execution through different mechanisms. For instance, centrally organized and concise learning materials may reduce unnecessary information-search demands, while readily accessible submission links may reduce the operational effort required to locate the appropriate submission facility. Meanwhile, clearly presented assignment instructions and rubrics may help students interpret expectations and monitor their progress towards completion. However, these potential relationships require more focused conceptual examination rather than being inferred from general evaluations of LMS effectiveness. The present study therefore adopts a feature-specific perspective by distinguishing MCLR, PELA, and PTRC rather than treating the LMS as a single, undifferentiated technological system.

Taken together, these gaps indicate the need for a more integrated conceptual approach to understanding students' assignment-related behaviour in digital learning environments. The proposed framework addresses this need by examining three distinct dimensions of the student experience: the cognitive demands associated with learning materials, the accessibility of assignment submission links, and the clarity of task instructions and assessment criteria. TAM provides a theoretical basis for understanding students' perceptions of digital functionality, while CLT explains the potential implications of unnecessary cognitive demands. Insights from self-regulated learning further clarify how access to relevant information and clearly defined expectations may support students' planning, monitoring, and

management of academic tasks. These perspectives are complementary but conceptually distinct, and their integration provides a rationale for investigating how specific characteristics of digital learning environments may relate to SDA.

The conceptual contribution of this study lies in shifting the analytical focus from general technology acceptance and system-level evaluation towards specific digital learning characteristics and a behaviourally relevant academic outcome. By proposing relationships between MCLR, PELA, PTRC, and SDA, the framework offers a basis for examining whether the organization of learning materials, the accessibility of submission facilities, and the clarity of assessment information may help explain students' adherence to assignment deadlines. This approach may provide a more task-oriented understanding of digital learning environments and inform future research into interface design and academic task management. Nevertheless, the proposed relationships represent conceptual propositions that require empirical validation before causal conclusions can be established.

5. Practical Implications

The findings of this study provide actionable insights for stakeholders across higher education institutions. By examining the cognitive and operational friction associated with digital learning management systems (LMS), this section outlines practical recommendations designed to optimize course delivery, instructional architecture, system administration, and student learning behaviours.

5.1 Practical Implications for Course Instructors

Course instructors occupy a critical position in establishing the daily operational environment of digital instruction. To enhance pedagogical clarity and minimize administrative burden, instructors should establish a centralized "single source of truth" within the learning platform. The practice of distributing course materials, lecture slides, and submission portals across fragmented communication channels such as broadcast emails, instant messaging groups, and multi-nested LMS directories introduces unnecessary extraneous cognitive load and creates information asymmetry among learners. Consolidating all course deliverables into a unified, flattened interface optimizes information retrieval and reinforces structural clarity.

Additionally, instructors should prioritize task transparency by integrating assignment rubrics directly alongside corresponding lecture materials and course content. Maintaining persistent visibility of evaluation criteria demystifies academic expectations, mitigates task ambiguity, and reduces routine administrative inquiries, allowing communication to shift toward substantive academic discourse.

5.2 Practical Implications for Instructional Designers

Instructional designers must incorporate principles from human-computer interaction (HCI) and cognitive load theory to curate digital learning environments that support efficient information processing. Central to this approach is the implementation of a flat navigation architecture. Deep hierarchical directory structures exacerbate transactional distance; designing course interfaces that conform to a "zero-to-one click" retrieval threshold ensures that core academic assets remain immediately accessible to students.

Furthermore, instructional design frameworks should operationalize spatial-temporal co-location. By embedding assignment submission links directly adjacent to relevant weekly lecture notes, readings, and rubrics, designers eliminate the spatial separation between content consumption and task execution. This co-location mitigates the split-attention effect, streamlining the transition from knowledge acquisition to assessment completion.

5.3 Practical Implications for Institutional IT Administrators

From an enterprise technology perspective, higher education IT administrators must shift strategic priorities from tool acquisition toward system convergence and platform integration. The unchecked proliferation of disparate, standalone educational applications frequently leads to platform fragmentation, forcing users to manage fragmented workflows across multiple external systems.

Institutional IT infrastructure should emphasize the integration of third-party cloud storage, collaborative platforms, and assessment mechanisms into a singular, unified dashboard. By minimizing software context-switching and authentication barriers, institutional convergence improves system interoperability, stabilizes user experience, and fosters a reliable digital ecosystem.

5.4 Practical Implications for Students

For learners, the structural and technical optimizations outlined above serve to significantly lower task initiation friction. Procedural obstacles—such as navigating complex folder hierarchies or searching for misplaced assessment criteria—often serve as behavioural triggers for academic procrastination and cognitive fatigue.

When digital learning environments provide seamless, immediate access to required materials and submission portals, operational barriers are substantially reduced. Consequently, students are better equipped to engage in effective self-regulated learning (SRL), maintain proactive time management practices, and demonstrate sustained academic task completion.

6. CONCLUSION

This conceptual paper addresses the pervasive challenge of digital information fragmentation within higher education by synthesizing the Technology Acceptance Model (TAM) and Cognitive Load Theory (CLT) into an integrated, empirically testable framework. By operationalizing Material Cognitive Load Reduction (MCLR), Perceived Ease of Link Access (PELA), and Perceived Task & Rubric Clarity (PTRC) as direct antecedents of Student Deadline Adherence (SDA), this framework provides a robust theoretical foundation for evaluating how interface design influences academic behaviour and task execution.

The synthesized model demonstrates that streamlining digital information architecture plays a pivotal role in preserving cognitive bandwidth and mitigating operational friction during task initiation. By minimizing extraneous cognitive load and eliminating spatial-temporal barriers within learning management systems, user-centered digital environments enable students to allocate working memory capacity toward high-level domain processing and self-regulated learning rather than administrative navigation.

To validate the conceptual relationships and formal hypotheses articulated in this paper, the upcoming empirical phase of this research will utilize IBM SPSS Multiple Linear Regression to analyse quantitative data collected across higher education institutions. Ultimately, this framework offers academic leadership, instructional designers, and educational technology administrators a data-driven, cognitive-friendly roadmap for designing digital learning environments that optimize student engagement, foster timely task completion, and elevate overall institutional learning outcomes.

REFERENCES

1. Al-Adwan, A. S., Albelbisi, N. A., Hujran, O., Al-Rahmi, W. M., & Alkhalifah, A. (2021). Developing a holistic success model for sustainable e-learning: A structural equation modeling approach. Sustainability, 13(16), Article 9453. https://doi.org/10.3390/su13169453
2. Alhazbi, S., Al-ali, A., Tabassum, A., Al-Ali, A., Al-Emadi, A., Khattab, T., & Hasan, M. A. (2024). Using learning analytics to measure self-regulated learning: A systematic review of empirical studies in higher education. Journal of Computer Assisted Learning, 40(4), 1658–1674. https://doi.org/10.1111/jcal.12982
3. Almaiah, M.A., Al-Khasawneh, A. & Althunibat, A. Exploring the critical challenges and factors influencing the E-learning system usage during COVID-19 pandemic. *Educ Inf Technol* **25**, 5261–5280 (2020). https://doi.org/10.1007/s10639-020-10219-y
4. Almusharraf, A. I. (2024). An investigation of university students' perceptions of learning management systems: Insights for enhancing usability and engagement. *Sustainability*, 16(22), 10037. https://doi.org/10.3390/su162210037

5. Al-Nuaimi, M. N., & Al-Emran, M. (2021). Learning management systems and technology acceptance models: A systematic review. Education and Information Technologies, 26, 5499–5533. https://doi.org/10.1007/s10639-021-10513-3
6. Andrade, H., & Du, Y. (2005). Student perspectives on rubric-referenced assessment. *Practical Assessment, Research, and Evaluation*, 10(3), 1–11. https://doi.org/10.7275/g367-vg89
7. Bannert, M., Sonnenberg, C., Mengelkamp, C., & Pieger, E. (2015). Short- and long-term effects of training self-regulated learning in hypermedia study environments. *Computers in Human Behavior*, 52, 273–285. https://doi.org/10.1016/j.chb.2015.05.038
8. Basyah, N. A., Fahmi, I., Ali, I., Rusli, Z., & Majid, R. A. (2025). The acceptance of technology model and learning management systems: A systematic review. *Jurnal Penelitian Pendidikan IPA*, 11(10), 23–32. https://doi.org/10.29303/jppipa.v11i10.7394
9. Broadbent, J. (2017). Comparing online and blended learner's self-regulated learning strategies and academic performance. *The Internet and Higher Education*, 33, 24–32. https://doi.org/10.1016/j.iheduc.2017.01.004
10. Corkin, D. M., Shirley, M. L., & Lindt, S. F. (2014). The role of the classroom environment in students' academic procrastination. *The Journal of Educational Research*, 107(4), 295–308. https://doi.org/10.1080/00220671.2013.807494
11. Costley, J., & Lange, C. (2018). The effects of course design on extraneous cognitive load in online learning environments. *Educational Technology Research and Development*, 66(4), 897–916. https://doi.org/10.1007/s11423-018-9584-3
12. 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
13. de Barba, P. G., Oliveira, E. A., & English, N. (2025). Development and validation of a learning analytics rubric for self-regulated learning. Educational Technology Research and Development, 73, 3223–3245. https://doi.org/10.1007/s11423-025-10521-x
14. De Koning, B. B. (2024). Mitigating the split-attention effect through physical and mental integration strategies in higher education. *Educational Psychology Review*, 36(2), 112–128. https://doi.org/10.1007/s10648-024-09852-x
15. DeLone, W. H., & McLean, E. R. (2003). The DeLone and McLean model of information systems success: A ten-year update. Journal of Management Information Systems, 19(4), 9–30. https://doi.org/10.1080/07421222.2003.11045748
16. Guzmán, A., & Zambrano, R. (2024). Examining element interactivity and information dispersion in digital learning environments. *Educational Technology Research and Development*, 72(1), 45–63. https://doi.org/10.1007/s11423-024-10340-9
17. Instructure. (2024). *Beyond fragmentation: Integrating digital tools for a seamless learning experience in higher education*. Times Higher Education Digital Maturity Report.
18. Mutlu-Bayraktar, D., Cosgun, V., & Altan, T. (2022). Cognitive load in multimedia learning environments: A systematic review. *Computers & Education*, 141, 103618. https://doi.org/10.1016/j.compedu.2019.103618
19. Norman, D. A. (2013). *The design of everyday things* (Revised and expanded ed.). Basic Books.
20. Paas, F., & van Merriënboer, J. J. G. (2020). Cognitive load theory: Methods to manage working memory load in the design of complex learning. *Current Directions in Psychological Science*, 29(4), 394–398. https://doi.org/10.1177/0963721420922183
21. Panadero, E., & Jonsson, A. (2013). The use of scoring rubrics for formative assessment purposes revisited: A review. *Educational Research Review*, 9, 129–144. https://doi.org/10.1016/j.edurev.2013.01.002
22. Pathify. (2025). *Student digital experience survey 2025: How fragmented digital systems erode student success and belonging*. EDUCAUSE Corporate Member Publications.
23. Rabin, E., Kalman, Y. M., & Levenberg, A. (2020). Academic procrastination in online courses: An institutional-level analysis. *Computers & Education*, 153, 103889. https://doi.org/10.1016/j.compedu.2020.103889
24. Reddy, Y. M., & Andrade, H. (2010). A review of rubric use in higher education. *Assessment & Evaluation in Higher Education*, 35(4), 435–448. https://doi.org/10.1080/02602930902862859
25. Steel, P. (2007). The nature of procrastination: A meta-analytic and theoretical review of quintessential self-regulatory failure. *Psychological Bulletin*, 133(1), 65–94. https://doi.org/10.1037/0033-2909.133.1.65

26. Sunstein, C. R. (2021). Sludge: What stops us from getting things done and what to do about it. The MIT Press. https://doi.org/10.7551/mitpress/13859.001.0001
27. Sweller, J. (2024). Cognitive load theory: Emerging trends, innovations, and applications in digital environments. *Instructional Science*, 52(3), 301–315. https://doi.org/10.1007/s11251-024-09650-1
28. Venkatesh, V., & Bala, H. (2008). Technology acceptance model 3 and a research agenda on interventions. *Decision Sciences*, 39(2), 273–315. https://doi.org/10.1111/j.1540-5915.2008.00192.x
29. Wolters, C. A., Won, S., & Hussain, M. (2017). Examining the relations of time management and procrastination within a model of self-regulated learning. *Metacognition and Learning*, 12(3), 381–399. https://doi.org/10.1007/s11409-017-9174-1
30. Xue, L., Mat Rashid, A., & Ouyang, S. (2024). The Unified Theory of Acceptance and Use of Technology (UTAUT) in higher education: A systematic review. SAGE Open, 14(1), 1–22. https://doi.org/10.1177/21582440241229570
31. You, J. W. (2016). Identifying significant indicators for predicting online students' learning performance: A system log data analysis. *The Internet and Higher Education*, 29, 23–30. https://doi.org/10.1016/j.iheduc.2015.11.003
32. Zimmerman, B. J., & Schunk, D. H. (Eds.). (2021). *Self-regulated learning and academic achievement: Theoretical perspectives* (3rd ed.). Routledge. https://doi.org/10.4324/9781003153177