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The 8th International Conference on Technology, Education, and Social Science
“Navigating Global Transformation in an Uncertain World: Interdisciplinary
Perspective on Economics, Business, Education, Law, Agriculture, Food
Technology, Politics and Society” July 30th, 2026

UNLOCKING STUDENT ENGAGEMENT IN DIGITAL LEARNING: A CONCEPTUAL FRAMEWORK INTEGRATING LMS QUALITY AND PSYCHOLOGICAL CAPITAL

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ABSTRACT

Background: Meaningful student engagement in digital learning remains a persistent challenge in higher education. Although Learning Management Systems (LMSs) provide essential technological infrastructure, system availability and usage do not necessarily translate into sustained behavioural, emotional, and cognitive engagement. This limitation suggests that students' psychological resources in digital learning environments require more theoretical attention.

Objective: This conceptual paper develops an integrative framework explaining how LMS quality may influence multidimensional student engagement through Psychological Capital (PsyCap), comprising hope, self-efficacy, resilience, and optimism.

Theoretical Approach: The framework integrates the DeLone and McLean Information Systems Success Model, Social Cognitive Theory (SCT), and the Job Demands-Resources (JD-R) framework. Drawing on these complementary perspectives, we conceptualise LMS system, information, and service quality as environmental resources that strengthen students' psychological capacities, while PsyCap functions as an internal personal resource that facilitates meaningful engagement with digital learning.

Propositions: The paper proposes that (1) LMS system quality, information quality, and service quality positively contribute to students' PsyCap; (2) PsyCap positively influences behavioural, emotional, and cognitive engagement; and (3) PsyCap mediates the relationship between LMS quality and multidimensional student engagement. The framework therefore positions student engagement not as a direct technological outcome, but as a process through which digital resources interact with students' psychological resources.

Theoretical Contribution: The paper extends existing LMS and student engagement literature by connecting information-system quality with learner psychology through an integrated environmental–personal resource perspective. It further identifies PsyCap as a theoretically meaningful mechanism for explaining why comparable LMS environments may produce different levels of student engagement. The proposed framework provides a foundation for future empirical testing and advances a human-centred perspective on digital learning design.

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Keywords: *JD-R Model, Learning Management System, Psychological Capital, Student Engagement, Social Cognitive Theory, Technology Acceptance Model, e-Learning Success*

INTRODUCTION

Embedding meaningful student engagement within digital learning environments remains a persistent challenge in higher education. While modern Learning Management Systems (LMS) provide essential infrastructure for course delivery, content organization, and communication, technological availability alone does not guarantee active learning participation or resolve feelings of surface-level participation and digital isolation (Al-Busaidi & Al-Shihi, 2012; Sun et al., 2008). Although traditional Information Systems (IS) research highlights system quality, information quality, and service quality as foundational drivers of technology adoption (DeLone & McLean, 2003), technical quality alone cannot explain why learners operating within identical digital environments exhibit vastly different engagement levels (Fredricks et al., 2004; Kahu, 2013). This discrepancy highlights an urgent need to examine the psychological mechanisms bridging technological infrastructure and active learning.

To address this theoretical gap, this paper positions Psychological Capital (PsyCap)—a positive state-like psychological capacity comprising hope, efficacy, resilience, and optimism (Luthans et al., 2007)—as a vital mediating mechanism linking LMS quality to multidimensional student engagement (Carmona-Halty et al., 2019; You, 2016). Rather than treating technology as a direct determinant of learning behavior, we argue that high-quality LMS environments function as *environmental resources* that stimulate and reinforce students' internal *personal resources* (PsyCap), which subsequently drive behavioral, cognitive, and emotional engagement (Carmona-Halty et al., 2019; Demerouti et al., 2001).

To establish a non-redundant and multi-layered theoretical foundation, this framework synthesizes three complementary theoretical perspectives that address different aspects of the proposed relationships. The DeLone and McLean IS Success Model (2003) serves as the technical baseline by categorizing the LMS environment into three core dimensions: system quality, information quality, and service quality. This perspective provides the foundation for conceptualizing LMS quality as a multidimensional technological resource that shapes students' experiences within digital learning environments.

Building on this technical foundation, Social Cognitive Theory (SCT; Bandura, 1986) functions as the explanatory engine of the framework through the principle of triadic reciprocal determinism, which emphasizes the dynamic interaction between environment, person, and behavior. In this framework, LMS quality represents the environmental component, while students' internal cognitive and affective states represent the personal component that influences learning behavior. SCT therefore explains how the characteristics of a digital learning environment can influence students' psychological states and, subsequently, stimulate meaningful learning engagement.

Finally, the Job Demands–Resources (JD-R) Model (Demerouti et al., 2001; Bakker & Demerouti, 2017) provides an overarching perspective that integrates the

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technical and psychological dimensions of the framework. LMS quality is conceptualized as an environmental learning resource, while Psychological Capital (PsyCap) represents a personal resource that can support students in responding to the demands of digital learning. This dual-resource perspective explains how high-quality digital learning environments, combined with students’ psychological resources, can facilitate the conversion of technological affordances into active and sustained learning involvement.

By integrating these perspectives, this paper advances a conceptual framework and a set of testable propositions that redefine educational technology evaluation from purely technical adoption toward a human-centered, psychologically empowering approach. To guide this theoretical synthesis, the paper addresses three core research questions:

RQ1 (Theoretical Direct Effects): *How do LMS system quality, information quality, and service quality theoretically serve as environmental resources to foster multidimensional student engagement (behavioral, cognitive, and emotional) (DeLone & McLean, 2003; Fredricks et al., 2004)?*

RQ2 (Psychological Mediation Pathway): *Through what theoretical mechanisms does Psychological Capital (PsyCap)—specifically hope, efficacy, resilience, and optimism—mediate the relationship between LMS quality dimensions and multidimensional student engagement (Luthans et al., 2007; Youssef-Morgan & Luthans, 2015)?*

RQ3 (Translational Principles & Agenda): *What actionable design, pedagogical, and policy principles emerge from this integrated framework to guide the development of human-centered digital learning environments and direct future empirical research (Al-Fraihat et al., 2020)?*

LITERATURE REVIEW & THEORETICAL FRAMEWORK

2.1 Information Systems Success in Educational Contexts

The evaluation of Learning Management Systems (LMS) in higher education has historically relied on Information Systems (IS) success literature. The updated Information Systems Success Model developed by DeLone and McLean (2003) provides a multidimensional framework for assessing technology performance across three distinct dimensions: System Quality, Information Quality, and Service Quality. In higher education settings, System Quality captures platform stability, swift navigation, system accessibility, and user-friendly interface design (Aparicio et al., 2016; Ifinedo, 2017). Information Quality assesses the accuracy, timeliness, structure, relevance, and formatting of educational materials delivered through the platform (Yakubu & Dasuki, 2018). Service Quality encompasses the technical, administrative, and pedagogical support provided to users, including responsiveness, instructor feedback, and technical assistance (Roca et al., 2006). While these technical dimensions establish baseline system adoption, IS success models alone cannot fully account for psychological variability among learners.

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2.2 Psychological Capital (PsyCap) in Academic Contexts

Originating from positive organizational behavior, Psychological Capital (PsyCap) is conceptualized as an individual's positive state-like psychological development characterized by four core HERO resources (Luthans et al., 2007; Luthans & Youssef-Morgan, 2017): **Hope**: Persevering toward goals and redirecting paths to goals to succeed ('willpower' and 'waypower') (Snyder, 2002). **Self-Efficacy**: Having the confidence to take on and put in the necessary effort to succeed at challenging tasks (Bandura, 1997). **Resilience**: Sustaining and bouncing back from adversity, conflict, or failure to attain success (Luthans, 2002). **Optimism**: Making positive attributions about succeeding now and in the future (Luthans et al., 2007).

Importantly, PsyCap represents state-like psychological capacities that are open to development through targeted environmental interventions (Luthans et al., 2006; Youssef-Morgan & Luthans, 2015). In academic environments, students with elevated academic PsyCap exhibit greater study motivation, academic performance, and psychological well-being (Carmona-Halty et al., 2019; Siu et al., 2014; You, 2016).

2.3 Multidimensional Student Engagement

Student engagement is widely recognized as a critical determinant of learning success, persistence, and academic satisfaction (Fredricks et al., 2004; Kahu, 2013). This study adopts the tripartite conceptualization established by Fredricks et al. (2004), spanning three interrelated dimensions: **Behavioral Engagement**: Pertains to active participation, task completion, assignment submission, and involvement in learning activities. **Cognitive Engagement**: Reflects deep processing, self-regulation, mental effort, and mastery-oriented learning strategies (Broadbent & Poon, 2015; Wong et al., 2021). **Emotional Engagement**: Encompasses positive affective reactions toward instructors, peers, and the learning environment, including interest, enthusiasm, and a sense of belonging.

2.4 Theoretical Integration: DeLone & McLean, SCT, and JD-R

To avoid redundant theory combination, each selected perspective plays a distinct functional role in the integrated framework. The DeLone and McLean (2003) IS Success Model defines the technical environment (System, Information, and Service Quality). Social Cognitive Theory (Bandura, 1986) provides the explanatory mechanism through triadic reciprocal determinism (Environment → Person → Behavior), explaining how system features shape internal psychological states (PsyCap) to elicit engagement behaviors. Finally, the Job Demands-Resources (JD-R) framework (Bakker & Demerouti, 2017; Demerouti et al., 2001) serves as the overarching structural umbrella, conceptualizing LMS quality as an environmental learning resource and PsyCap as a personal resource. Together, this dual-resource mechanism protects against digital learning burnout and empowers active student participation.

CONCEPTUAL MODEL & PROPOSITIONS DEVELOPMENT

Figure 1 illustrates the conceptual framework linking LMS Quality dimensions to Multidimensional Student Engagement through the mediating mechanism of Psychological Capital (PsyCap).

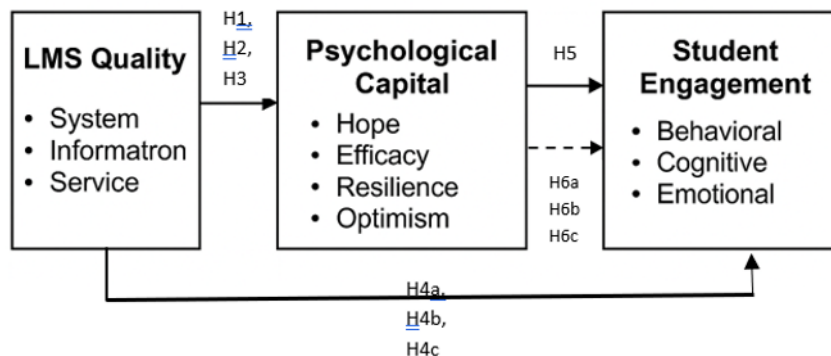


Figure 1: Conceptual Framework

3.1 Relationships Between LMS Quality Dimensions and Psychological Capital

A well-structured digital learning environment operates as a supportive psychosocial scaffold that directly shapes learners' cognitive and affective states (Ifinedo, 2017). When an LMS provides reliable navigation, intuitive features, and stable performance (System Quality), it minimizes technological frustration and cognitive overload, enabling students to focus their mental energy on goal attainment. In accordance with Social Cognitive Theory, experiencing seamless system navigation builds digital agency and pathway thinking (Hope) while reinforcing confidence in task execution (Self-Efficacy) (Bandura, 1997; Snyder, 2002). Furthermore, platform stability empowers learners to recover quickly from minor digital disruptions (Resilience) and maintain positive academic expectations (Optimism) (Luthans et al., 2007).

Proposition 1a (P1a): *LMS System Quality serves as an environmental resource that positively influences students' Psychological Capital.*

Information Quality—characterized by clear, structured, timely, and relevant content—provides the academic foundation needed for clear goal setting and self-regulation (Yakubu & Dasuki, 2018). When learning materials are well-organized and accessible, cognitive friction is reduced, reinforcing learners' sense of academic mastery (Self-Efficacy) and encouraging strategic study pathways (Hope) (Snyder, 2002). Clear information quality also clarifies performance expectations, fostering a constructive academic mindset (Optimism).

Proposition 1b (P1b): *LMS Information Quality serves as an environmental resource that positively influences students' Psychological Capital.*

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Service Quality reflects the responsiveness of technical support, instructor feedback, and communication channels (Roca et al., 2006). Responsive service quality mitigates feelings of digital isolation and technological helplessness. Knowing that timely assistance is readily available strengthens student resilience during academic difficulties and sustains goal-directed motivation (Luthans, 2002; Martin & Bolliger, 2018).

Proposition 1c (P1c): *LMS Service Quality serves as an environmental resource that positively influences students' Psychological Capital.*

3.2 Relationships Between LMS Quality Dimensions and Student Engagement

High-quality LMS systems provide the structural baseline for student participation. Seamless system features eliminate technical barriers to entry, enabling continuous behavioral access and reducing cognitive fatigue (Aparicio et al., 2016). Accurate information quality stimulates intrinsic curiosity and emotional connection to course content (Yakubu & Dasuki, 2018), while supportive service quality establishes institutional connectedness (Roca et al., 2006).

Proposition 2a (P2a): *LMS System Quality directly promotes multidimensional student engagement.*

Proposition 2b (P2b): *LMS Information Quality directly promotes multidimensional student engagement.*

Proposition 2c (P2c): *LMS Service Quality directly promotes multidimensional student engagement.*

3.3 Relationship Between Psychological Capital and Student Engagement

Internal psychological resources are paramount for sustaining active engagement in virtual learning spaces (Siu et al., 2014; You, 2016). Self-efficacy provides the conviction necessary to tackle complex online assignments (Bandura, 1997). Hope fuels the energy needed for goal setting and study planning (Snyder, 2002). Optimism maintains constructive expectations despite academic stress (Luthans et al., 2007), and resilience enables students to bounce back from academic setbacks or online fatigue (Carmona-Halty et al., 2019; Luthans, 2002). Together, these four HERO resources drive deep behavioral, cognitive, and emotional involvement.

Proposition 3 (P3): *Psychological Capital positively influences multidimensional (behavioral, cognitive, and emotional) student engagement.*

3.4 The Mediating Role of Psychological Capital

Technological features do not operate in a psychological vacuum. While LMS platforms offer digital tools, actual student engagement depends on the learner's psychological state and readiness (Selim, 2007; Youssef-Morgan & Luthans, 2015). In line with JD-R theory and Social Cognitive Theory, LMS quality acts as an environmental resource that first builds personal psychological resources (PsyCap), which then translate

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into active student engagement (Bakker & Demerouti, 2017; Bandura, 1986). PsyCap serves as the cognitive and motivational bridge explaining how technological infrastructure unlocks deep academic involvement.

Proposition 4a (P4a): *Psychological Capital mediates the relationship between LMS System Quality and multidimensional student engagement.*

Proposition 4b (P4b): *Psychological Capital mediates the relationship between LMS Information Quality and multidimensional student engagement.*

Proposition 4c (P4c): *Psychological Capital mediates the relationship between LMS Service Quality and multidimensional student engagement.*

Table 1: Key Construct Definitions and Theoretical Roles

Construct	Model Role	Definition & Conceptual Scope
Learning Management System (LMS) Quality	Independent Variable (Environmental Resource)	Digital platform delivery, tracking, and management capabilities spanning System Quality, Information Quality, and Service Quality (DeLone & McLean, 2003).
Psychological Capital (PsyCap)	Mediating Variable (Personal Resource)	A positive state-like psychological capacity characterized by hope, self-efficacy, resilience, and optimism (Luthans et al., 2007).
Student Engagement	Dependent Variable (Behavioral / Cognitive Outcome)	A multidimensional construct encompassing behavioral participation, cognitive investment, and emotional involvement in learning (Fredricks et al., 2004).

PROVISIONAL CONCEPTUAL FRAMEWORK & FUTURE RESEARCH AGENDA

To transition this conceptual framework from a theoretical synthesis into an empirically testable model for future research, this section articulates the structural boundaries, construct operationalization guidelines, and a prospective research agenda for empirical validation.

4.1 Structural Boundaries and Contextual Scope

The proposed framework conceptualizes LMS Quality (System, Information, and Service Quality) as an environmental resource (DeLone & McLean, 2003) that activates

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Psychological Capital (Hope, Efficacy, Resilience, Optimism) as a personal resource (Luthans et al., 2007), which subsequently drives multidimensional Student Engagement (Behavioral, Cognitive, Emotional) (Fredricks et al., 2004). While these theoretical principles apply broadly across higher education digital learning environments, future empirical studies should account for specific institutional and platform boundary conditions. Specifically, evaluating the framework across diverse platform ecosystems (e.g., open-source platforms like Moodle versus proprietary systems) and distinct student demographics will clarify how technological affordances interact with psychological readiness in varied educational settings.

4.2 Guidance for Construct Operationalization

For future researchers seeking to empirically test this conceptual model, the constructs should be operationalized using pre-validated, domain-specific instruments adapted from established literature. **LMS Quality (Independent Variable)** should be operationalized across its three core dimensions—System Quality, Information Quality, and Service Quality—drawing on established IS success frameworks (Al-Fraihat et al., 2020; DeLone & McLean, 2003). **Psychological Capital (Mediating Variable)** should capture state-like academic psychological strengths encompassing Hope, Efficacy, Resilience, and Optimism, using validated academic instruments such as the Academic PCQ-12 (Luthans et al., 2007). **Multidimensional Student Engagement (Dependent Variable)** should explicitly distinguish behavioral, cognitive, and emotional involvement rather than treating engagement as a single metric or relying on indicators such as login frequency, with measurement informed by validated educational engagement scales (Fredricks et al., 2004; Hart et al., 2011).

4.3 Prospective Empirical Agenda & Methodological Considerations

To validate the proposed hypotheses while minimizing potential methodological artifacts, future empirical investigations should adopt several complementary research strategies. Given the framework’s complex mediation structure and predictive focus, **Partial Least Squares Structural Equation Modeling (PLS-SEM)** using SmartPLS 4 is recommended to assess the measurement model, including indicator reliability, convergent validity, and HTMT discriminant validity, as well as the structural model through bootstrapped indirect effects, R^2 , f^2 , and Q^2 . Because the proposed constructs rely primarily on self-reported learner perceptions, future studies should also address **Common Method Bias (CMB)** through procedural controls, such as time-lagged data collection that separates the assessment of LMS quality from subsequent engagement measures, complemented by statistical diagnostics such as full collinearity VIF testing. Finally, researchers should extend beyond cross-sectional survey designs by adopting **longitudinal and cross-cultural approaches** to examine how sustained exposure to LMS quality may influence the development of PsyCap and changes in student

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engagement over time, while also assessing whether these relationships remain consistent across different cultural and educational contexts (Carmona-Halty et al., 2019).

CONCLUSION, THEORETICAL CONTRIBUTIONS, AND PRACTICAL IMPLICATIONS

5.1 Conclusion

This conceptual paper advances an integrative theoretical framework that bridges Information Systems (IS) research with positive educational psychology to explain student engagement in modern digital learning environments. By establishing Psychological Capital (PsyCap)—comprising self-efficacy, hope, optimism, and resilience—as a vital mediating mechanism between Learning Management System (LMS) quality and multidimensional engagement, this study pushes beyond conventional, technology-centric IS paradigms (DeLone & McLean, 2003; Youssef-Morgan & Luthans, 2015). Ultimately, while LMS system, information, and service quality establish the foundational technological infrastructure, a learner's internal psychological resources determine whether these technological affordances are successfully translated into deep behavioral, cognitive, and emotional engagement (Fredricks et al., 2004).

5.2 Theoretical Contributions

This conceptual framework advances educational technology and psychological literature in three distinct ways;

Extending IS Success Models Beyond Technological Determinism: Traditional IS frameworks, such as the DeLone and McLean (2003) model, primarily assume a direct trajectory from system quality to user satisfaction and technology adoption. By introducing PsyCap as a mediating mechanism, this framework demonstrates that technological features alone are insufficient to explain complex educational behaviors, positioning psychological readiness as a necessary cognitive catalyst for digital learning success.

Operationalizing JD-R in Digital Pedagogy: By integrating the Job Demands-Resources (JD-R) framework (Bakker & Demerouti, 2017; Demerouti et al., 2001) and Social Cognitive Theory (Bandura, 1986), this paper recontextualizes LMS features as environmental resources and PsyCap as a personal resource. This structural synergy explains the triadic reciprocal interaction between the digital environment, personal agency, and student behavior, demonstrating how high-quality technology activates psychological capital to buffer against digital fatigue and academic isolation.

Multidimensional Engagement Conceptualization: Rather than treating student engagement as a uniform metric or mere system log-in frequency, the framework systematically links specific technological and psychological dimensions to behavioral,

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cognitive, and emotional engagement (Fredricks et al., 2004; Kahu, 2013), providing a more granular theoretical roadmap for future educational technology research.

5.3 Practical & Managerial Implications

From an applied perspective, this framework offers actionable guidance for higher education institutions, educators, and software developers:

For Instructional Designers & Educators (Pedagogical Strategy): Course delivery must move beyond static content repositories. Educators should structure LMS activities to deliberately cultivate specific PsyCap components—for instance, deploying progress trackers and clear assignment pathways to build hope (Snyder, 2002), interactive formative assessments to enhance self-efficacy (Bandura, 1997), transparent feed-forward grading rubrics to maintain optimism (Luthans et al., 2007), and peer-collaboration forums with flexible submission policies to foster academic resilience (Hodges et al., 2020; Luthans, 2002).

For System Developers & EdTech Providers (Platform Design): Software developers should design human-centered interfaces that reduce extraneous cognitive load and minimize technological friction. Incorporating real-time feedback dashboards, adaptive learning pathways, responsive technical support, and intuitive UI/UX navigation directly strengthens system and service quality, preventing user frustration and reinforcing learner self-efficacy (Aparicio et al., 2016; Ifinedo, 2017).

For Higher Education Administrators (Policy & Institutional Support): University leaders must recognize that investing in software licensing and digital infrastructure is incomplete without supporting student psychological readiness. Educational policies should combine digital literacy training with psychological skill-building programs, ensuring students possess both the technical competency and mental resilience needed for sustainable online learning (Carmona-Halty et al., 2019; You, 2016).

5.4 Concluding Remarks

While this paper is conceptual in nature, it establishes an empirically testable foundation for future research. As digital learning environments continue to evolve, this framework serves as a timely reminder that the true efficacy of educational technology relies not merely on the sophistication of the system deployed, but on the psychological empowerment of the learners navigating it.

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