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Reconceptualising Digital Literacy as a Determinant of Academic Performance in Technology-Enhanced Learning Environments: A Mediated–Moderated Conceptual Framework

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Abstract: Digital literacy is now understood as a multidimensional competence. It spans information and data literacy, communication and collaboration, digital content creation, safety and problem solving. Yet the evidence on how it relates to academic performance in higher education is inconsistent. The pooled correlation is moderate, some competence areas predict grades while others do not, and several studies find no direct effect. This review argues that the inconsistencies arise because digital literacy is usually treated as a technical skill with a direct effect. It is better understood as a learning competence whose influence travels through learning processes and depends on context. Using a model-building approach to conceptual research, the review synthesises recent studies from major publishers. It integrates the DigComp framework, Self-Regulated Learning Theory, Social Cognitive Theory and the Technology Acceptance Model into a mediated–moderated framework. The framework advances seven propositions: digital literacy influences academic performance directly and indirectly through self-regulated learning, learning engagement and critical thinking; AI readiness and institutional digital support strengthen the direct relationship; and the mode of generative AI use can weaken the critical-thinking pathway when AI substitutes for, rather than supports, students' own cognitive work. The review offers a dimension-specific, mechanism-based account of digital literacy for the generative AI era and specifies how each proposition can be tested with structural equation modelling. It closes with implications for curriculum design, faculty development and institutional policy in higher education, including in Malaysia.

Keywords: Digital literacy, academic performance, technology-enhanced learning, self-regulated learning, AI readiness, higher education

1. Introduction

The integration of digital technologies into higher education has accelerated over the past decade, particularly following the widespread adoption of online and hybrid learning. Learning management systems, AI-supported tutoring, adaptive platforms, learning analytics and digital assessment have changed how content is delivered, how students study and how their work is judged. Whether students can learn with these tools, and not merely operate them, has therefore become a question about academic success itself.

The question is sharper in higher education than elsewhere. University students are expected to work independently and to find and judge scholarly sources for themselves. Increasingly, they must also decide when and how to use

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generative AI in assessed work. A student who can navigate a learning platform may still struggle to judge the credibility of a source or to regulate their own study in an environment full of distraction. The gap between operating technology and learning with it is therefore widest at the level of study where independent learning is most demanded.

Policy frameworks reflect this shift. The European Commission's DigComp 2.2 framework defines digital competence across five areas: information and data literacy, communication and collaboration, digital content creation, safety, and problem solving. It also extends these areas to interaction with AI-driven systems (Vuorikari et al., 2022). A review of a decade of higher education studies finds that institutions have embedded digital literacy through pedagogical innovation and institutional strategy. Its benefits for engagement and achievement, however, depend on contextual factors such as platform usability, institutional support and learner motivation (Ramdana et al., 2026).

The field's central term is itself contested. W. Ng (2012) modelled digital literacy as the intersection of technical, cognitive and social-emotional dimensions. A systematic review of higher education research later found that "digital literacy" and "digital competence" are used inconsistently and often interchangeably (Spante et al., 2018). Morgan et al. (2022) proposed a three-part framework of technical, cognitive and etiquette dimensions and found that students rated themselves lowest on evaluating digital information, including judging its bias and quality. Critical-pedagogy perspectives go further, asking learners to question the tools they use and the power relations those tools embed (Prayitno & Kaparang, 2025).

These definitional debates point to a broader scholarly problem. A competence can matter for performance in two ways: directly, because it makes academic tasks easier, or indirectly, because it enables the learning processes that produce achievement. Studies that measure digital literacy as a single technical score and test only a direct path cannot tell these apart. They therefore cannot explain why the same competence appears to matter in some samples and not in others.

The empirical record shows this inconsistency. A meta-analysis of 23 studies reported a moderate pooled correlation between information literacy and academic performance (r = .33) that varied across countries and publication periods (Ashiq et al., 2025). Studies that decompose digital competence find that some areas predict performance while others do not. Among Malaysian university students, information and data literacy, communication and collaboration, content creation and problem solving were significant predictors of learning performance, but safety was not (Chaw & Tang, 2024). In an online Swedish course, only information and data literacy and communication and collaboration predicted grades after adjustment for prior education (Holm, 2025).

Where positive effects appear, recent studies increasingly locate them in mechanisms. Among Iranian students, digital competence affected academic performance both directly and through digital informal learning (Mehrvarz et al., 2021). Digital literacy also predicted performance through knowledge sharing in online environments (Salimi et al., 2025), and digital informal learning, self-efficacy and digital competence partially mediated its effect on academic performance (Zakir et al., 2025). Metacognitive self-regulation has likewise been identified as a bridge between digital learning competence and achievement (Ko, 2026).

Generative AI adds a further dimension. AI tools have been associated with higher achievement among college students (Sun & Zhou, 2024), and AI literacy has been linked to better learning outcomes and academic performance (Singh et al., 2024; Wicaksana et al., 2025). AI literacy, however, is not the same as general digital literacy. Conceptual work defines it through knowing and understanding AI, using and applying it, evaluating and creating with it, and attending to its ethics (D. T. K. Ng et al., 2021), and these capacities may matter for performance in ways that general digital skills do not.

Some of the evidence qualifies the optimistic view altogether. In a survey of 947 U.S. college students, AI literacy was positively associated with academic uses of ChatGPT, whereas general digital literacy contributed negatively. ChatGPT use that displaced academic work was associated with lower self-efficacy and creativity (Zhang et al., 2026). Elsewhere, e-learning adoption did not predict GPA once academic engagement was taken into account (Kim et al., 2019). The digitisation of academic reading can also reproduce inequalities, disadvantaging students who have fewer devices or weaker digital reading skills (Kuhn et al., 2024). These findings do not undermine the case for digital literacy, but they show that its benefits are conditional, and a credible account must explain when they fail to appear.

Malaysian and regional scholarship has begun to address these questions. Among Malaysian university students, digital competence areas relate differently to learning performance, and a few of these relationships vary by semester (Chaw & Tang, 2024). Studies of Chinese university students have examined the factors that shape their digital literacy (Rui & Attan, 2024) and how technology acceptance and use develop it over time (Liu et al., 2025).

Evidence specific to technology-enhanced higher education in the region remains thin, however. Most studies are cross-sectional, test one mechanism at a time and do not model AI readiness or institutional conditions. On the teaching side, lecturers' digital literacy is perceived to support students' learning outcomes (Mardiana, 2024). Evidence that educators' digital competence raises achievement directly is mixed, however (Núñez Canal et al., 2024), which again points towards indirect and conditional effects.

The research gap is therefore not a shortage of studies linking digital literacy to performance. What is missing is an integrated framework that is dimension-specific, explains the mechanisms through which digital literacy operates, and specifies the individual and institutional conditions under which those mechanisms strengthen or weaken, including the use of generative AI. No single study reviewed here combines parallel mediators with AI readiness and institutional support as moderators.

This review addresses that gap. Its objectives are to: (i) reconceptualise digital literacy as a multidimensional determinant of academic performance; (ii) integrate the theoretical perspectives that explain why digital literacy should influence academic success; (iii) develop a framework linking digital literacy, self-regulated learning, learning engagement, critical thinking and AI-supported learning; (iv) state the resulting mediating and moderating relationships as testable propositions; and (v) propose directions for their empirical validation. The review does not claim to test these relationships, nor to establish causal effects; it offers a theoretically grounded model for others to test.

2. Scope and Approach of the Review

This is a narrative, theory-building review, not a systematic review. Conceptual papers contribute through argument, not data, so their method lies in how theories are selected, combined and used to derive claims (Gilson & Goldberg, 2015). Following Jaakkola's (2020) typology, the review adopts a model design: it builds a framework that predicts relationships between constructs and states them as propositions. Digital literacy is the domain theory, the phenomenon to be explained. Four method theories supply the explanatory logic for particular paths. DigComp defines the dimensions of digital literacy; Self-Regulated Learning Theory explains the metacognitive pathway; Social Cognitive Theory explains the self-efficacy and engagement pathway; and the Technology Acceptance Model explains why students' beliefs about AI tools condition their use.

Literature was identified through searches of publisher databases (Elsevier, Wiley, Springer Nature, Sage, Emerald and Taylor & Francis) and Google Scholar. The searches targeted studies published mainly between 2018 and 2026 that link digital literacy or digital competence to academic performance in higher education, and were supplemented by the foundational source for each theory. Studies were drawn on where they tested a mediated or moderated relationship, decomposed digital literacy into dimensions, or reported null or negative findings that the framework must explain. Because the search was purposive, not exhaustive, the review can show that the proposed relationships are plausible and consistent with existing evidence. It cannot show how often or how strongly they hold across all published studies.

3. Literature Review

3.1 The Evolution and Multidimensionality of Digital Literacy

Conceptions of digital literacy have shifted from a narrow emphasis on basic computer operation to a multidimensional construct (W. Ng, 2012; Spante et al., 2018). Contemporary definitions describe the capacity to locate, evaluate, create, communicate and apply digital information effectively, ethically and critically. DigComp 2.2 organises this capacity into five competence areas and adds examples of knowledge, skills and attitudes for interacting with AI systems (Vuorikari et al., 2022). This review uses the term *digital literacy* for the overall construct and the DigComp areas as its dimensions. DigComp is the framework that the Malaysian and international studies reviewed here use to measure it (Chaw & Tang, 2024; Holm, 2025).

A tension runs through the literature. Although digital literacy is acknowledged conceptually as a higher-order capacity, much empirical research still operationalises it through low-level tasks such as navigating a learning management system or running a basic search. Treating digital literacy as a procedural gatekeeper leaves a question unanswered: how do higher-order digital practices, such as evaluating the credibility of sources, managing cognitive load and building knowledge collaboratively, influence academic outcomes? That students report least confidence in exactly these evaluative skills (Morgan et al., 2022) makes the omission more consequential.

3.2 Reconceptualising Academic Performance in Digital Ecologies

Academic performance has traditionally been measured through grade point average (GPA), examination results and assignment marks. While these summative indicators remain administrative staples, technology-enhanced learning increasingly asks students to demonstrate competences that extend beyond examination performance, including critical thinking, complex problem solving and the synthesis of information across digital sources. Factors that shape university students' digital literacy, such as prior experience and institutional context, therefore also shape which aspects of performance it can influence (Rui & Attan, 2024).

Part of the inconsistency in the literature reflects a misalignment between how digital literacy is measured and how performance is measured. When a reductive, operational measure of digital skill is paired with grades that reward higher-order thinking, weak or contradictory results are to be expected. This review therefore treats academic performance as including both conventional summative outcomes (GPA, examination and course grades) and the quality of higher-order academic work. Empirical tests of the framework should report the two separately.

3.3 Dynamics of Technology-Enhanced Learning Environments

The relationship between digital literacy and academic performance is most visible in technology-enhanced learning environments (TELEs), which integrate digital technologies into teaching and learning to improve educational effectiveness. These environments have evolved from static course pages into interactive ecosystems that include AI-

powered tutoring, adaptive platforms, virtual laboratories, digital assessment, learning analytics and intelligent feedback. Because such platforms change how content is delivered and consumed, how well students use the available digital resources is associated with their performance, at least in technology-enhanced secondary classrooms (Nshunguyimana et al., 2025). The digital capability of teaching staff is perceived to matter as well (Mardiana, 2024).

TELEs also change the cognitive demands placed on learners. Interpreting adaptive pathways or automated feedback requires self-regulation and problem solving, and generative AI can either reduce extraneous cognitive load or displace the cognitive work that produces learning (Abidi et al., 2025; Zhang et al., 2026). Most studies, however, offer cross-sectional snapshots of students' digital literacy. Longitudinal evidence is scarce, although it shows that technology acceptance and use shape the development of digital literacy over time (Liu et al., 2025). A student who has the operational literacy to succeed in an introductory, LMS-based course may lack the AI and critical data literacy required for senior-level research projects. Understanding this requires designs that trace digital competences and academic outcomes together over time.

3.4 Theoretical Foundations

Four theories underpin the framework (Fig. 1). Each explains a different path, so together they account for both the direct and the indirect relationships between digital literacy and academic performance (Table 1).

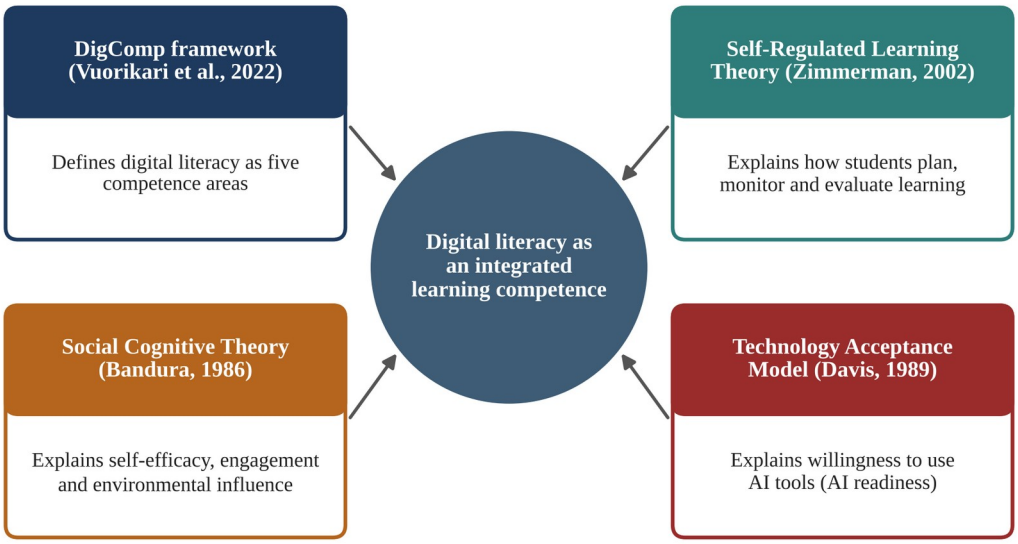


Fig. 1 - Theoretical foundations of the framework

DigComp framework. DigComp 2.2 defines digital competence as five areas of knowledge, skills and attitudes (Vuorikari et al., 2022). In this framework it specifies the content of the independent variable. It also justifies the expectation that dimensions will differ in their effects, since information and data literacy and communication and collaboration are most directly tied to academic tasks.

Self-Regulated Learning (SRL) Theory. Self-regulated learners plan, monitor and evaluate their own learning through cyclical forethought, performance and self-reflection phases (Zimmerman, 2002). Digital environments place these demands on students continuously. SRL is also linked to performance: a meta-analysis of 49 studies found that SRL training improved university students' academic performance (g = 0.37) as well as their strategies and motivation (Theobald, 2021).

Social Cognitive Theory (SCT). SCT explains behaviour through the reciprocal influence of personal factors, behaviour and environment, with self-efficacy as a central personal factor (Bandura, 1986). It explains why digitally competent students are more likely to engage: mastery of digital tools builds confidence, and confidence sustains behavioural, emotional and cognitive engagement (Fredricks et al., 2004). Its emphasis on the environment also grounds the role of institutional digital support.

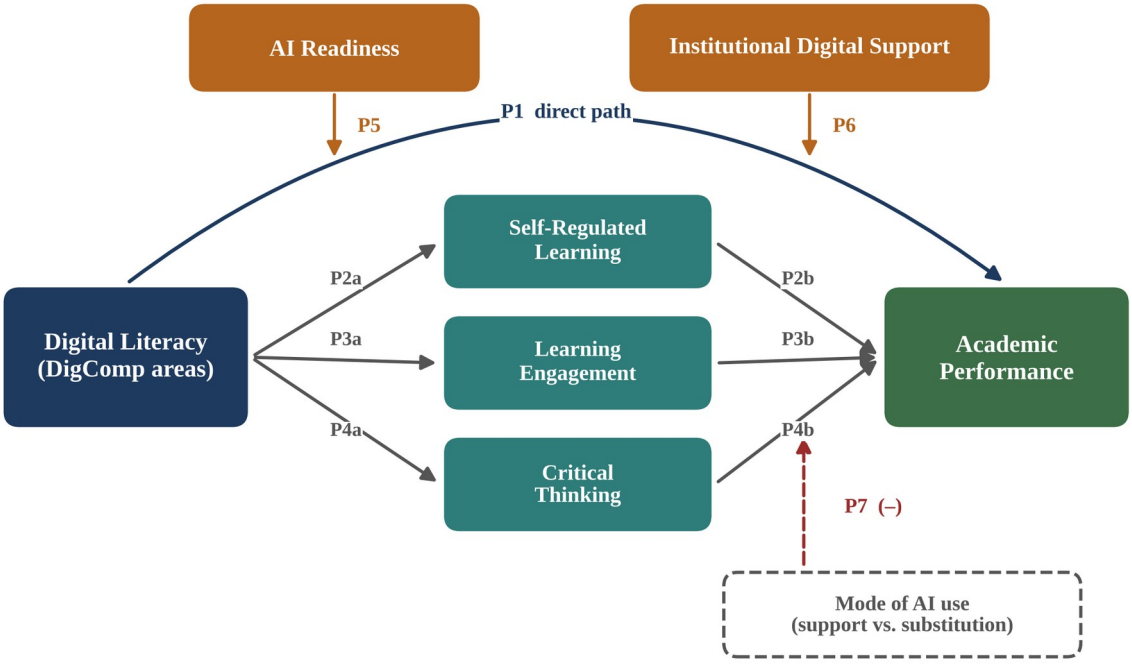
Technology Acceptance Model (TAM). TAM holds that perceived usefulness and perceived ease of use shape the intention to use, and the actual use of, a technology (Davis, 1989). In this framework TAM does not explain digital literacy itself. It explains *AI readiness*, students' beliefs about and willingness to use AI tools, and therefore why students with similar digital literacy may draw on AI-supported learning to very different degrees.

Table 1 - Theory–Construct Mapping

Theory	Construct(s) explained	Role in the framework	Propositions
DigComp 2.2 (Vuorikari et al., 2022)	Digital literacy and its five competence areas	Defines the independent variable; grounds dimension-specific effects	P1
Self-Regulated Learning Theory (Zimmerman, 2002)	Self-regulated learning	Metacognitive pathway from digital literacy to performance	P2a, P2b
Social Cognitive Theory (Bandura, 1986)	Self-efficacy, learning engagement, institutional environment	Motivational–behavioural pathway; environmental moderation	P3a, P3b, P6
Technology Acceptance Model (Davis, 1989)	AI readiness (perceived usefulness and ease of use of AI tools)	Individual moderator of the direct path	P5, P7
Critical digital literacy (W. Ng, 2012; Prayitno & Kaparang, 2025)	Critical thinking	Cognitive pathway from evaluative digital practices to performance	P4a, P4b

4. Conceptual Framework and Propositions

Fig. 2 summarises the framework. Digital literacy is the independent variable and academic performance the dependent variable. Three parallel mediators (self-regulated learning, learning engagement and critical thinking) explain *how* digital literacy influences performance. Two moderators (AI readiness and institutional digital support) explain *when* the direct relationship is stronger. The mode of AI use identifies a condition under which one pathway may weaken. Each proposition below is preceded by the argument that supports it, and Table 2 summarises them.



Solid arrows: positive paths. P2b–P4b: partial mediation. Dashed: conditional (friction) effect.

Fig. 2 - Mediated–moderated framework linking digital literacy and academic performance

4.1 The Direct Path

Students with stronger digital literacy are likely to locate and evaluate information more efficiently, communicate and collaborate more effectively online and spend less effort on the interface itself, leaving more attention for the academic content. Direct effects have been reported in several higher education samples (Mehrvarz et al., 2021; Salimi et al., 2025). Dimension-level evidence, however, shows that these effects are concentrated in information and data literacy and in communication and collaboration (Chaw & Tang, 2024; Holm, 2025). The direct path is therefore expected to be positive but uneven across competence areas.

P1: Digital literacy positively influences academic performance, and this effect is stronger for information and data literacy and for communication and collaboration than for other DigComp areas.

4.2 Mediating Mechanisms

4.2.1 Self-regulated learning

Students who understand how digital environments are structured are better able to set goals, plan, monitor their progress and evaluate their learning online. They are also better able to resist digital distraction, which supports assignment quality and higher-order thinking. Metacognitive self-regulation has been shown to link digital learning competence to achievement (Ko, 2026), and SRL training in turn improves university students' performance (Theobald, 2021). Because digital literacy is also expected to act directly (P1), mediation is expected to be partial.

P2a: Digital literacy positively influences self-regulated learning.

P2b: Self-regulated learning partially mediates the relationship between digital literacy and academic performance.

4.2.2 Learning engagement

Social Cognitive Theory predicts that mastery builds self-efficacy. Students with high digital literacy are therefore likely to feel less anxious when using complex TELEs such as virtual laboratories or adaptive platforms, and self-efficacy supports behavioural, cognitive and emotional engagement (Bandura, 1986; Fredricks et al., 2004). In one university sample, engagement was the route through which digital readiness and e-learning use reached achievement when direct effects were absent (Kim et al., 2019). In another, self-efficacy and related mechanisms partially mediated the effect of digital literacy on performance (Zakir et al., 2025).

P3a: Digital literacy positively influences learning engagement.

P3b: Learning engagement partially mediates the relationship between digital literacy and academic performance.

4.2.3 Critical thinking

Contemporary digital literacy requires students to evaluate the credibility of information, recognise bias, including algorithmic bias, and synthesise evidence from multiple sources. These evaluative practices are a form of critical thinking applied to digital material (W. Ng, 2012; Prayitno & Kaparang, 2025). Students who filter and verify information critically are likely to produce better-evidenced academic work and to solve problems more effectively, which is what higher-order assessments reward.

P4a: Digital literacy positively influences critical thinking.

P4b: Critical thinking partially mediates the relationship between digital literacy and academic performance.

4.3 Moderating Conditions

4.3.1 AI readiness

AI readiness refers to students' AI literacy, their attitudes towards AI tools and their ethical stance on using them, building on the components of AI literacy identified by D. T. K. Ng et al. (2021). Generative AI has been associated with higher achievement among college students (Sun & Zhou, 2024), and AI literacy has been linked to better learning outcomes and performance (Singh et al., 2024; Wicaksana et al., 2025). Drawing on TAM, students who see AI tools as useful and easy to use are more likely to apply their digital literacy through AI-supported tutoring and feedback, which should amplify its effect on performance. Students with low AI readiness may find that the returns to general digital literacy plateau when assessments assume AI-supported work.

P5: AI readiness positively moderates the relationship between digital literacy and academic performance, such that the relationship is stronger when AI readiness is high.

4.3.2 Institutional digital support

Consistent with Social Cognitive Theory's emphasis on the environment, individual competence is enacted within institutional conditions. Institutional digital support refers to infrastructure, reliable access, technical training, accessible digital design and the digital capability of teaching staff (Mardiana, 2024). A recent review indicates that the effect of digital literacy on engagement and achievement depends on platform usability and institutional support (Ramdana et al., 2026). The shift to digital academic reading also disadvantages students with less access or weaker digital reading skills unless support is provided (Kuhn et al., 2024). Where support is strong, structural barriers are removed and students can make full use of their digital literacy; where it is weak, even highly literate students may face bottlenecks that suppress performance.

P6: Institutional digital support positively moderates the relationship between digital literacy and academic performance, such that the relationship is stronger when institutional support is high.

4.3.3 Mode of AI use as a boundary condition

A framework that predicted only positive effects would be incomplete. How students use generative AI also matters, not only whether they use it. ChatGPT use that supports academic work is positively associated with self-efficacy and creativity, whereas use that displaces academic work is negatively associated with them (Zhang et al., 2026). Students themselves report concerns about inaccuracy and over-reliance alongside the benefits (Abidi et al., 2025). When AI substitutes for evaluating, synthesising and constructing arguments, the critical-thinking pathway through which digital literacy improves performance is likely to weaken.

> **P7:** The mode of AI use moderates the critical-thinking pathway: when generative AI substitutes for, rather than supports, students' own cognitive work, the indirect effect of digital literacy on academic performance through critical thinking is weaker.

Table 2 - Summary of Propositions

No.	Relationship	Type	Key supporting evidence
P1	Digital literacy → academic performance (dimension-specific)	Direct	Chaw and Tang (2024); Holm (2025); Mehrvarz et al. (2021)
P2a–b	Digital literacy → SRL → academic performance	Partial mediation	Ko (2026); Theobald (2021); Zimmerman (2002)
P3a–b	Digital literacy → engagement → academic performance	Partial mediation	Kim et al. (2019); Zakir et al. (2025); Fredricks et al. (2004)
P4a–b	Digital literacy → critical thinking → academic performance	Partial mediation	W. Ng (2012); Prayitno and Kaparang (2025)
P5	AI readiness × digital literacy → academic performance	Moderation (+)	D. T. K. Ng et al. (2021); Sun and Zhou (2024); Singh et al. (2024)
P6	Institutional support × digital literacy → academic performance	Moderation (+)	Ramdana et al. (2026); Kuhn et al. (2024); Mardiana (2024)
P7	Mode of AI use × (digital literacy → critical thinking → academic performance)	Moderated mediation (−)	Zhang et al. (2026); Abidi et al. (2025)

5. Discussion

5.1 Theoretical Contributions

The review makes four contributions. First, it reconceptualises digital literacy as a multidimensional learning competence, not a technical skill, and makes this claim testable. P1 predicts that DigComp areas will differ in their effects. On this view, the dimension-level null results in earlier studies are an expected pattern, not an anomaly (Chaw & Tang, 2024; Holm, 2025).

Second, it moves beyond single-theory models by assigning each of four theories a specific explanatory role (Table 1). DigComp defines the construct, SRL Theory and SCT explain the metacognitive and motivational pathways, and TAM explains AI readiness. This division of labour avoids the common practice of citing several theories without showing what each one explains.

Third, the framework specifies three parallel, partially mediating mechanisms between digital literacy and achievement (P2 to P4). Earlier models tested one or two mechanisms in isolation (Mehrvarz et al., 2021; Salimi et al., 2025); testing them together allows researchers to compare their relative strength.

Fourth, the framework extends digital literacy models to the generative AI era. It separates AI readiness from general digital literacy and positions it as an individual moderator (P5) alongside institutional support as an environmental moderator (P6). It also introduces a boundary condition (P7) that predicts when AI use undermines the benefits of digital literacy instead of amplifying them (Zhang et al., 2026).

5.2 Practical Implications

For higher education institutions, the framework argues against confining digital literacy to standalone ICT modules. Embedding digital competences in discipline-specific learning outcomes lets students practise them in the contexts where they are assessed. Because P1 predicts that information and data literacy and communication and collaboration matter most for performance, these areas deserve priority. Educators can design project-based and collaborative tasks that build online self-regulated learning (P2), sustain engagement (P3) and require students to verify, evaluate and synthesise digital sources (P4).

For AI-era teaching, P5 and P7 together imply that institutions should develop AI readiness while also shaping *how* AI is used. Requiring students to explain, defend and source their AI-assisted work has been recommended as a way to encourage supportive, not substitutive, use (Abidi et al., 2025). At the governance level, P6 implies that investment in infrastructure must be matched by technical support, accessible design and continuous faculty development (Mardiana, 2024). In Malaysia, where digital-competence evidence at university level is already emerging (Chaw & Tang, 2024), these priorities can be aligned with national graduate-competency frameworks.

5.3 Limitations

As a conceptual review, the framework has not been tested, and its propositions should be read as theoretically grounded expectations rather than findings. The literature search was purposive, not systematic, so the review cannot estimate how consistently each relationship holds. The evidence it draws on is largely cross-sectional and self-reported, so causal ordering, for example whether engagement builds digital literacy or the reverse, cannot be assumed. The framework is specified for higher education students in technology-enhanced environments; relationships may differ in schools, in fully face-to-face settings or where access is very limited. Finally, the strength of each pathway may vary with how academic performance is measured, since grade-based measures and measures of higher-order work may respond differently to the same competences.

5.4 Further Research

Each limitation suggests a direction for further work. Because the framework is untested, it should first be validated with covariance-based or partial least squares structural equation modelling (CB-SEM or PLS-SEM). A recent PLS-SEM study integrating TAM with Self-Determination Theory among 450 Pakistani undergraduates, using 5,000 bootstrap resamples to test mediated paths, offers a practical template (Shah et al., 2026). P2 to P4 can be tested as parallel indirect effects, P5 and P6 as interaction terms, and P7 as a moderated mediation. Measuring digital literacy at the level of DigComp areas would allow P1 to be tested directly.

Because the review was purposive, a systematic review or meta-analysis of mediated digital literacy models would establish how consistently each pathway holds. Because the evidence is cross-sectional, longitudinal designs that follow cohorts from the first year to graduation are needed to establish causal ordering, including whether SRL precedes engagement (Liu et al., 2025). Because the framework is bounded to higher education, comparisons across disciplines, institution types and countries would test its generalisability. Data-intensive STEM programmes, for example, may weight information and data literacy more heavily than text-based humanities programmes. Finally, because the measurement of performance matters, studies should report grade-based and higher-order outcomes separately, and should develop measures of generative AI literacy and ethical AI use as they bear on P5 and P7.

6. Conclusions

Digital literacy has become a foundational competence in technology-enhanced higher education, but its relationship with academic performance is neither simple nor uniform. This review has argued that the inconsistent findings in the literature are what one would expect if digital literacy is a multidimensional learning competence. Its effects travel through self-regulated learning, engagement and critical thinking, and they depend on AI readiness, institutional support and the way students use AI. The framework integrates DigComp, Self-Regulated Learning Theory, Social Cognitive Theory and the Technology Acceptance Model into a set of testable propositions. It gives researchers an agenda for empirical validation, and it gives educators and policymakers a basis for developing digital competence in ways that improve student achievement, not merely accompany it.

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Conflict of Interest

The authors declare no conflicts of interest.

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