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Enhancing the Measurement of Financial Literacy: Integrating Digital Dimensions for Inclusive Financial Well-Being

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ABSTRACT

Despite global initiatives to strengthen financial capability, existing measurement frameworks often fall short in capturing the behavioural and digital dimensions essential for promoting inclusive financial well-being in a rapidly digitising economy. This study aims to enhance the conceptual and general literature of financial literacy measurement by systematically reviewing recent scholarly. A qualitative content and thematic analysis was conducted on 35 Scopus-indexed articles published between 2024 and 2025, focusing on the integration of behavioural finance theories and digital inclusion practices. The findings reveal critical intersections among financial literacy, behavioural intentions, and digital competencies, supported by frameworks such as the Theory of Planned Behaviour and Theory of Reasoned Action. Emerging trends highlight the transformative potential of AI-driven tools, workshops, gamified learning, and mobile financial services in reshaping financial education and behaviour. The study also underscores the role of digital empowerment in mitigating financial exclusion and recommends the adoption of culturally sensitive, multi-dimensional measurement instruments. This review advances a more inclusive and responsive agenda for financial well-being in diverse socio-economic contexts by reframing financial literacy as a dynamic behavioural construct moderated by digital access and psychological factors.

Keywords: financial literacy, digital literacy, financial inclusion, behavioural interventions, measurement tools

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INTRODUCTION

Financial literacy broadly encompasses the knowledge, skills, and attitudes necessary for individuals and households to make informed and effective financial decisions that contribute to their financial well-being and inclusion (Blue et al., 2025; Tulcanaza-Prieto et al., 2025). It involves understanding financial concepts such as budgeting, saving, investing, risk management, and credit management, essential for navigating an increasingly complex financial environment. Complementing this is digital literacy within the financial context, which refers to individuals' ability to effectively access, interpret, and utilize digital financial services and tools offered by FinTech innovations (Tulcanaza-Prieto et al., 2025). Digital literacy plays a critical role in enhancing financial inclusion by enabling broader populations to participate in digital economies, providing means for saving, borrowing, and investing through online platforms and mobile money services (Lajfari & Soumbara, 2025; Al-Afeef & Alsmadi, 2025).

Accurate and standardised measurement of financial literacy is fundamental for formulating effective policy interventions and educational programs (Potrich et al., 2025; Bertola & Lo Prete, 2025). Robust measurement frameworks enable the identification of target groups with limited financial knowledge and the evaluation of intervention programs' efficacy. However, challenges remain in the consistency and cultural validity of existing instruments, impairing cross-population comparability (Potrich et al., 2025). Incorporating digital literacy into these measurement paradigms is becoming increasingly necessary as digital financial services reshape the landscape of financial decision-making (Tulcanaza-Prieto et al., 2025).

The evolution of digital financial services, including mobile money, online banking, and FinTech platforms, has dramatically transformed how individuals conduct financial transactions and interact with financial institutions (Lajfari & Soumbara, 2025). Digital literacy not only facilitates the adoption of these technologies but also empowers users to manage financial risks and optimise financial choices in digital environments (Al-Afeef & Alsmadi, 2025). The integration of digital and financial literacy is proving vital for enhancing financial behaviours and outcomes in diverse socio-economic contexts, especially as FinTech continues to expand globally (Rahman & Sadik, 2025; Hu & Liu, 2025).

Globally, financial exclusion remains a significant challenge, aggravated by behavioural biases, insufficient financial education, and socio-economic inequalities, which disproportionately affect underserved and vulnerable populations such as low-income individuals, women, and indigenous communities (Bhattacharya et al., 2025; Abdulkareem et al., 2025; Blue et al., 2025). These groups often face barriers in accessing financial products and services, partly due to limited financial and digital literacy, which hampers their ability to make informed decisions and increases their vulnerability to financial exploitation, fraud, and suboptimal financial practices (Blue et al., 2025; Ahmad, 2025).

Problem Statement

Despite concerted global efforts to improve financial and digital literacy, considerable gaps persist in the consistent measurement and understanding of the behavioural mechanisms through which these literacies influence financial decision-making and inclusion (García-Santillán et al., 2025; Sunil & Sathish Kumar, 2025). Existing financial literacy frameworks often overlook the critical role of behavioural intention and cognitive biases that affect individuals' financial choices (Pitthan & De Witte, 2025; Sharma et al., 2025).

Moreover, with the rapid proliferation of digital financial services, there is a growing need for integrated approaches that simultaneously develop both financial literacy and digital literacy to ensure meaningful inclusion and improved financial well-being (Tulcanaza-Prieto et al., 2025; Rahman & Sadik, 2025). The lack of comprehensive, culturally relevant measurement tools that capture the interplay between these literacies further inhibits the design of targeted behavioural interventions and policies.

Research Objectives

This paper aims to address the outlined challenges through three key objectives. This study aims to systematically analyse recent scholarly literature to achieve two main objectives: (1) to extract and synthesis common themes, theoretical frameworks, and intervention models related to financial literacy through content analysis; and (2) to conduct a thematic review to categories the findings into key emerging research domains, behavioural outcomes, and digital transformations in financial literacy practices. The study seeks to map the evolving intersections between financial education, behavioural intention, and digital innovation across diverse populations and socio-economic contexts in order to achieve these objectives.

LITERATURE REVIEW

Current measurement tools for financial literacy have predominantly relied on self-reported questionnaires and knowledge-based assessments, yet several limitations have been identified across studies. Bertola and Lo Prete (2025) critically note frequent measurement error in financial literacy surveys, emphasizing that respondents often prefer guessing to admitting ignorance, thus inflating or distorting self-assessed financial literacy levels. This phenomenon hampers the accuracy and interpretability of survey results, especially when these self-reports are used to guide policy and educational interventions. Similarly, Potrich, Vieira, and Paraboni (2025) highlight the challenges of inconsistent and imprecise measurement instruments across different contexts, advocating for the development of standardized, brief scales such as the Youth Financial Literacy Short Scale to enhance comparability and practical application.

Furthermore, the reliability of self-assessed financial literacy has come under scrutiny. Blue et al. (2025) report the underestimation and inconsistent measurement of financial literacy, particularly among marginalized or vulnerable groups, suggesting that self-reports alone inadequately capture individuals' true financial knowledge and skills. Their findings underscore the need for complementary objective measurements to better understand financial behaviour and decision-making.

An emerging trend is the recognition of digital literacy as either an integrated or moderating construct within financial literacy frameworks. Tulcanaza-Prieto et al. (2025) explore digital literacy's moderating effect on the relationship between financial literacy, financial inclusion, and financial well-being, particularly in the Ecuadorian context. Their results caution against treating financial literacy in isolation, especially as digital financial services proliferate and digital competencies become essential for meaningful financial engagement.

Historical Evolution and Emerging Theme

The development of studies on financial literacy and behavioural intention can be observed in four stages. From 2000 to 2010, research efforts primarily focused on identifying the role of financial education in enhancing awareness about money management among young people. During this period, financial literacy became a more formalised subject in various educational systems, yet limited work considered its behavioural impact.

In the second phase (2011–2015), researchers began exploring behavioural elements more closely. Drawing upon behavioural economics, theories such as the Theory of Reasoned Action (TRA) and the Theory of Planned Behaviour (TPB) gained attention. Studies showed that young people's intentions regarding saving, spending, or borrowing were strongly influenced by social expectations, beliefs, and perceived control. This era also saw a rise in context-specific studies, especially in Asia and Latin America. The years between 2016 and 2020 marked a shift toward understanding digital financial behaviour. Researchers investigated how mobile banking, financial stress, and online learning environments shaped decision-making. Increased focus was placed on vulnerable groups such as first-generation college students, low-income families, and digital non-natives.

Following the pandemic (2021–2025), scholarly work has increasingly addressed financial resilience and digital adaptation. The role of AI in personalising financial education and providing predictive insights into student behaviours has taken centre stage. New frameworks have emerged to incorporate adaptive learning and digital inclusion into financial decision-making models. One clear trend in the literature is a shift from treating financial literacy as static knowledge to understanding it as a dynamic behavioural process. Recent studies explore how attitudes, emotional states, and social environments influence decision-making, often in combination with digital tools. The rise of fintech applications and AI-driven platforms has added new layers of influence, allowing for real-time engagement, nudging, and personalised learning pathways.

There is also increasing emphasis on inclusion and diversity. Scholars are paying closer attention to underrepresented populations such as rural youth, displaced communities, and female-headed households. This trend encourages a more intersectional and culturally sensitive approach. Additionally, the use of mixed methods and interdisciplinary collaboration has expanded the analytical depth of recent research.

METHOD

This study is a conceptual paper and employs a general review approach to explore the evolving landscape of financial literacy, behavioural finance, and digital inclusion. The data collection involved retrieving peer-reviewed articles from the Scopus database, focusing on publications from the year 2025 to ensure contemporary relevance and alignment with current financial literacy challenges and innovations. The search was conducted using a combination of keywords such as "financial literacy," "digital financial literacy," "financial inclusion," "behavioural finance," "financial well-being," and "digital economy." A total of 35 articles were identified that met the inclusion criteria: published in indexed journals, full-text accessible, and directly addressing the dimensions of financial education, decision-making, or inclusion across various populations and geographical contexts. The data analysis followed two complementary qualitative strategies. First, content analysis was applied to extract common themes, theoretical frameworks, and intervention types. Second, a thematic review was conducted to categorise the findings into emerging research domains, behavioural outcomes, and technological adaptations in financial literacy. This dual approach provided both conceptual depth and thematic structure to the review process, enabling an integrative understanding of how financial literacy is being measured, mediated by digital factors, and translated into actionable behavioural outcomes across socio-economic settings.

Results

Behavioural Theory Integration

Behavioural interventions in financial literacy increasingly leverage established psychological frameworks such as the Theory of Planned Behaviour (TPB) and the Theory of Reasoned Action (TRA) to understand and predict financial decision-making (Clark et al., 2025; Pitthan & De Witte, 2025). These models emphasise the role of behavioural intention as a proximal determinant of action, influenced by attitudes toward the behaviour, perceived social norms, and perceived behavioural control or confidence. For instance, financial confidence—the belief in one's ability to manage personal finances—emerges as a critical enabler of prudent financial behaviours and effective risk management (Sargent et al., 2025). Likewise, social norms shape financial habits by influencing perceptions of what others approve or engage in, which in turn affects individuals' intentions and actions (Bhattacharya et al., 2025). The application of TPB in financial literacy programs has elucidated how intention formation is often mediated by culturally embedded behaviours and community influence, underscoring the necessity for interventions to address not only knowledge but also the socio-psychological determinants of financial choices (Clark et al., 2025). These frameworks have also paved the way for understanding how nuances in demographic characteristics, such as age, gender, and education, modulate the relationship between financial attitudes and behaviours, suggesting tailored approaches are paramount (Blue et al., 2025).

Intervention Strategies

Empirical evidence supports an array of intervention strategies designed to enhance financial literacy and improve behavioural outcomes. Educational approaches dominate, including workshops, low-cost online programs, and gamified learning modules that increase engagement and knowledge retention (Bhattacharya et al., 2025; Platz & Zauner, 2025). Specifically, gamified educational interventions have been shown to increase the utility value of financial concepts among upper secondary education students by leveraging interactive, motivational designs that align with pedagogical best practices (Platz & Zauner, 2025).

Advancements in digital technology have introduced behavioral nudging and personalized guidance through mobile applications, robo-advisors, and AI-driven tools, which provide customized financial advice and prompt timely decision-making (Al-Afeef & Alsmadi, 2025; Laroze et al., 2025). These digital facilitators can overcome traditional barriers by offering scalable, context-sensitive interventions that adapt to user behavior, preferences, and cognitive biases. Notably, digital empowerment fosters greater inclusivity by reaching underserved populations who may lack access to conventional financial education resources (Al-Afeef & Alsmadi, 2025).

Addressing cognitive biases and risk perception is a crucial dimension within these interventions. Behavioural biases such as overconfidence, loss aversion, and present bias can distort financial decision-making, leading to suboptimal outcomes (Sunil & Sathish Kumar, 2025). Educational programs that incorporate lessons on bias recognition and risk assessment, combined with reflective learning, have been indicated to improve risk tolerance in line with financial goals (Pitthan & De Witte, 2025). By integrating behavioural theory with practical skill-building, these strategies enhance decision-making resilience against common psychological pitfalls.

Role of Digital Literacy in Financial Inclusion

Digital literacy has emerged as a critical enabler for broadening financial inclusion by facilitating greater access to and usage of financial services. Tulcanaza-Prieto et al. (2025) demonstrated that in the Ecuadorian context, digital literacy acts as a moderating variable that enhances the positive relationship between financial literacy, financial inclusion, and financial well-being. Their findings emphasize the importance of digital skills in navigating digital financial products, thus enabling users to capitalize on financial technology (FinTech) innovations that improve access to banking and other financial services. Rahman and Sadik (2025) further underscore digital literacy's role in enabling decent work and environmental sustainability through digital financial service adoption. Their results suggest that digital skills facilitate access to digital financial tools such as mobile wallets and online banking, which are essential components of contemporary financial inclusion efforts.

The impact of digital literacy on specific financial service adoption, such as mobile money and FinTech platforms, is well-documented. Lajfari and Soumbara (2025) found causal links between mobile money usage and improved financial inclusion outcomes across various African countries. Their research highlights that mobile money adoption hinges not only on financial literacy but significantly on users' digital competence. Similarly, Singh and Karamcheti (2025) illustrated that digital literacy substantially influences consumers' acceptance of robo-advisory services, emphasising its importance in harnessing emerging FinTech solutions.

Digital Literacy Measurement and Assessment

As digital financial services proliferate, the accurate measurement and assessment of digital financial literacy have become vital to understanding its interplay with traditional financial literacy. Almansour et al. (2025) introduce innovative metrics and assessment tools to evaluate digital financial literacy's evolving role, particularly in empowering users to master online financial services. Their approach integrates both digital and financial aspects to reflect the complex competencies required in the digital financial ecosystem.

Kim et al. (2025) add that measuring digital literacy involves assessing users' competence in safely and effectively using digital platforms, which in turn influences their financial knowledge application. They argue for comprehensive assessment frameworks that capture both the access and utilization dimensions of digital tools. The interaction between financial and digital literacy also shapes financial behaviour outcomes. Hu and Liu (2025) show that in rural Chinese households, digital literacy significantly moderates the association between financial literacy and risk-taking behaviour. Enhanced digital skills empower individuals to engage confidently in financial activities using digital channels, thereby improving their financial decision-making.

Mustafa et al. (2025) provide evidence that financial attitude and literacy combined with health literacy (including digital aspects) play a critical role in retirement planning decisions. Their findings illustrate how intertwined digital and financial literacies are in shaping complex financial behaviours, reinforcing the need for integrated measurement approaches.

Advances in Measurement Methodologies

Recent methodological innovations have transformed financial literacy measurement, introducing advanced techniques and holistic frameworks. Zhu (2025) pioneers the application of machine learning as a nuanced approach to capture financial literacy dimensions more effectively. By leveraging large datasets and sophisticated algorithms, machine learning promises to identify latent patterns and subgroups within populations that traditional survey methods may overlook, enhancing personalization in financial education and intervention.

Cross-cultural validation and scale development efforts have also gained prominence as researchers recognize the importance of culturally sensitive and globally applicable measurement tools. Lulaj and Mekaniwati (2025) propose the Financial Wellbeing Index (FWI) model tailored to socio-economic environments, such as circular economies and climate finance scenarios, offering a comprehensive approach anchored in diverse contexts. Along the same lines, Potrich et al. (2025) validate a short scale for youth financial literacy, addressing brevity without sacrificing reliability, an essential balance for inclusion across educational settings and cultures.

Li, Bin, and Zhang (2025) contribute evidence on measurement complexities by analysing financial literacy's influence on agricultural entrepreneurship, thus signalling domain-specific financial knowledge areas that general measures might omit. Similarly, García-Santillán, Zamora-Lobato, Tejada-Peña, and Valencia-Márquez (2025) underscore the multi-dimensional nature of financial literacy, encompassing education, attitudes, advice seeking, and capabilities, suggesting that a composite measurement approach yields a more accurate reflection of financial well-being and behaviour.

Gerrans, Hoffmann, McNair, and Pallant (2025) expand on multi-dimensional assessments by exploring heterogeneity in individuals' responses across various financial literacy domains. Their analysis points to the limitations of single-dimensional tests and emphasizes the importance of integrating objective knowledge with skills and subjective confidence assessments to better capture individual differences and predict behavioural outcomes.

Further research addresses the behavioural and cognitive aspects linked with financial literacy measurement. Pitthan and De Witte (2025) discuss the incorporation of behavioural biases within literacy frameworks, suggesting that awareness of biases in measurement instruments can lead to better-designed education initiatives. Meanwhile, Phung (2025) investigates financial literacy's connection to risk-taking behaviour, advocating for assessments that reflect psychological dimensions alongside factual knowledge to illuminate decision-making processes more thoroughly.

Moreover, the works of Sargent, Balasubramnian, Bowler, and Lambert (2025) explore retirement savings behaviour concerning financial literacy, revealing the dynamic nature of financial skills over time and the necessity for measurement tools capable of tracking behavioural evolution rather than static knowledge snapshots.

Collectively, the literature advocates for a paradigm shift from rudimentary, static financial literacy assessments toward innovative, culturally adaptable, and behaviourally informed measurement approaches. These advances promise to enhance the precision of financial literacy evaluations, thereby enabling more effective policymaking, tailored interventions, and ultimately, improved financial inclusion and well-being outcomes across diverse populations.

Effectiveness and Limitations

Studies demonstrate that behavioural interventions yield meaningful improvements in financial knowledge, behaviours, and overall well-being. For example, Clark et al. (2025) found that participants in a low-cost, online financial education program showed measurable increases in financial capabilities and confidence, translating into better saving and planning behaviours. Similarly, Bhattacharya et al. (2025) documented positive behavioural shifts in low-income mothers following targeted financial education, including enhanced budgeting and risk management.

Nevertheless, the efficacy of interventions varies widely by demographic, cultural, and contextual factors. Blue et al. (2025) emphasise that effects are often mitigated by socio-economic disparities, existing behavioural defaults, and limited digital access, especially in vulnerable and underserved groups. Pandey et al. (2025) highlight the importance of understanding heterogeneity across population segments to avoid one-size-fits-all programs that might perpetuate exclusion or unintended consequences. A significant challenge remains in sustaining long-term behavioural change post-intervention. Gerrans et al. (2025) illustrate that while immediate knowledge and behavioural improvements are achievable, maintaining these gains requires persistent reinforcement and supportive environments. Without ongoing engagement, individuals tend to relapse into prior behaviours, particularly in environments lacking formal financial advice or social support.

Moreover, integrating digital literacy with financial literacy is increasingly acknowledged as essential for effective behavioural interventions. Digital tools increase reach and personalisation but can inadvertently exacerbate vulnerabilities if digital exclusion persists (Al-Afeef & Alsmadi, 2025). Hence, combining behavioural insights with culturally sensitive content and inclusive digital strategies is critical for maximising impact. Overall, advancing behavioural interventions in financial literacy demands multidimensional approaches incorporating theoretical models, innovative pedagogy, digitally enabled personalised support, and continuous evaluation to address a complex interplay of knowledge, intention, bias, and socio-economic context.

Behavioural Implications of Digital and Financial Literacy Synergy

The synergistic relationship between digital and financial literacy has substantial behavioural implications. Tulcanaza-Prieto et al. (2025) reveal that digital literacy not only moderates the relationship between financial literacy and well-being but also enhances the capacity for informed financial decision-making in digital environments. Their study highlights that financial literacy without adequate digital literacy limits individuals' ability to benefit from modern financial services. Kim et al. (2025) further validate this moderation effect, showing that digital literacy heightens confidence and competence in financial decisions facilitated by digital platforms, which ultimately improves financial well-being.

Conversely, digital exclusion exacerbates financial vulnerability, as Blue et al. (2025) documented among Indigenous small business owners facing unsustainable financial practices. They emphasise that lack of digital financial skills, compounded by inadequate financial literacy, deepens exclusion and limits opportunities for economic advancement. Abdulkareem et al. (2025) similarly point to the risks digital exclusion poses in development contexts, noting that marginalised groups suffer due to limited access and skills, reinforcing socio-economic disparities. This digital divide underscores the urgent need for inclusive digital literacy policies.

Digital empowerment through improved literacy fosters financial mastery and social inclusion. Al-Afeef and Alsmadi (2025) discuss the transformative potential of digital literacy in enhancing financial knowledge and practical financial behaviours across socio-economic groups. Their findings suggest digital empowerment initiatives, coupled with financial education, are pivotal in mitigating exclusion and driving sustainable financial well-being. Collectively, these studies recommend integrated educational and policy approaches to concurrently elevate financial and digital literacies, optimizing financial inclusion and socio-economic development across diverse populations.

Financial Literacy's Contribution

Financial literacy plays a pivotal role in influencing individual and household financial behaviours, directly impacting saving, investment, and risk management decisions. Studies indicate that higher levels of financial literacy enhance the ability of households to allocate their financial assets more effectively, leading to improved management of financial risks and increased participation in risk asset investments (Liu & Fang, 2025; Guan, 2025). For instance, Liu and Fang (2025) find that financial literacy, mediated by cultural attitudes like Taoist culture, significantly improves household financial risk asset allocation, which suggests that cultural contexts interact with knowledge to shape financial choices.

Furthermore, financial literacy has been shown to foster entrepreneurial activities and positively affect household asset allocation. Li and Zhang (2025) demonstrate the positive effect of improved financial literacy on agricultural entrepreneurship, highlighting that financially literate individuals are more likely to engage in entrepreneurial ventures due to better understanding of financial markets and risk. Similarly, Luo and Zhu (2025) find that usage of credit cards, as an indicator of financial knowledge and behaviour, channels enhanced financial literacy into entrepreneurship by facilitating access to financial resources necessary for business activities.

Beyond these specific behaviours, financial literacy contributes widely to household economic security and the capacity to plan for long-term financial well-being. Studies such as Sargent et al. (2025) reveal that intention and literacy significantly influence retirement savings behaviour, underpinning the importance of capable financial decision-making over the lifecycle. Additionally, Guan (2025) empirically supports the linkage between financial literacy and increased property income at the household level, reflecting improved wealth accumulation. These findings collectively underscore financial literacy not only as financial knowledge acquisition but as a driver for sustainable financial inclusion and improved economic outcomes.

Digital Literacy and Financial Inclusion

Digital literacy increasingly acts as a catalyst for financial inclusion by enabling individuals to navigate digital financial services effectively. Lajfari and Soumbara (2025) highlight the dynamics of mobile money adoption in Africa, outlining how digital financial literacy enhances the use of mobile money platforms, which in turn support saving and borrowing activities among underserved populations. Similarly, Rahman and Sadik (2025) demonstrate the nexus between digital financial service adoption and decent work, emphasising that digital competencies amplify the benefits of financial inclusion.

However, the adoption of digital finance is not without behavioural challenges. Singh and Karamcheti (2025) discuss inhibitors to the acceptance of robo-advisors, elucidating that despite financial literacy, factors such as perceived risks and trust deficits can hinder technology adoption. This points to the complexity of digital financial inclusion, where mere literacy in financial concepts must be complemented by digital confidence, perceived usefulness, and risk tolerance. Tulcanaza-Prieto et al. (2025) further assert that digital literacy moderates the relationship between financial literacy and financial well-being, indicating that integrated literacies are essential for leveraging digital financial services.

Furthermore, digital literacy impacts extend to vulnerable populations. Abdulkareem et al. (2025) illustrate the compounded effects of financial, gender, and digital inclusion on sustainable development, stressing that gaps in digital literacy exacerbate social inequalities in accessing financial services. This reaffirms that digital literacy must be an integral component of financial inclusion strategies.

Societal and Policy Implications

Addressing financial exclusion among underserved populations necessitates tailored and inclusive interventions. Blue et al. (2025) provide insights from Indigenous small business owners, exposing how unreasonable financial practices and low literacy impede inclusion, calling for culturally relevant educational programs. Likewise, Abdulkareem et al. (2025) prioritise intersectional approaches that combine financial, gender, and digital inclusion to leave no one behind in the pursuit of equitable economic growth.

Standardised and cross-culturally valid measurement tools for financial literacy are critical to informing policy and targeting interventions effectively. Nogueira et al. (2025) emphasise the need for harmonised measurement in OECD countries to better compare and understand literacy impacts on behaviour. Sharma et al. (2025) advocate for integrating behavioural theories within educational policies to enhance sustainable investment decisions, illustrating the link between literacy and economic participation.

Moreover, promoting cross-sectoral collaboration is imperative. While the literature matrix mentions Sargant et al. (2025) in the outline, although not present in the matrix, supportive findings from Bhattacharya et al. (2025) and Lulaj and Mekaniwati (2025) underscore that partnerships between educators, fintech developers, and regulators are vital for advancing financial literacy that embraces digital innovations and behavioural insights. These collaborations can facilitate the development of gamified learning, low-cost digital education platforms, and regulatory frameworks that protect vulnerable users. In sum, the pathway to enhanced financial inclusion and well-being is multifaceted, requiring a synergistic approach that integrates advanced financial literacy with digital competencies, behavioural interventions, and inclusive policy frameworks tailored to diverse socio-economic contexts.

Discussion

This study critically maps the evolving nexus of financial literacy measurement, behavioural interventions, and digital literacy integration to advance financial inclusion and well-being among diverse populations. As global financial systems undergo rapid digitisation, traditional methods of financial education and assessment are increasingly inadequate to meet the complex realities of digitally enabled financial decision-making. This necessitates a shift toward a more integrated, context-sensitive approach that accounts for behavioural dimensions and digital competency.

At the heart of this transformation lies the convergence of behavioural theory and financial education. Theoretical frameworks such as the Theory of Planned Behaviour (TPB) and the Theory of Reasoned Action (TRA) have provided robust insights into how financial decisions are shaped not just by knowledge, but by intentions, confidence, social norms, and perceived behavioural control (Clark et al., 2025; Pitthan & De Witte, 2025). These models explain why financial knowledge alone is insufficient: without motivation and behavioural intent, individuals are unlikely to translate understanding into action. For example, financial confidence, the belief in one's ability to manage money—has proven to be a decisive factor in improving risk management and savings behaviours (Sargent et al., 2025). Equally, social and cultural norms mediate behavioural intention, underscoring the need for community-sensitive education interventions (Bhattacharya et al., 2025).

To truly advance financial literacy measurement, researchers have moved beyond static, one-dimensional scales toward dynamic, multi-faceted tools that incorporate attitudinal, cognitive, and behavioural metrics. Recent innovations include machine learning-based models for identifying hidden literacy gaps (Zhu, 2025) and short scales validated for youth that balance brevity and reliability (Potrich et al., 2025). These tools have illuminated how financial literacy varies across demographic groups and how behavioural biases such as overconfidence and loss aversion can distort financial outcomes (Sunil & Sathish Kumar, 2025). The push toward standardised but flexible frameworks, like the Financial Wellbeing Index (FWI) proposed by Lulaj and Mekaniwati (2025), has enabled researchers and policymakers to compare financial competencies across diverse economic and cultural settings.

In parallel, digital literacy has emerged as a crucial enabler of enhanced behavioural interventions and financial inclusion. As FinTech becomes central to personal finance—from mobile banking and robo-advisors to AI-enabled savings tools—digital competence determines whether individuals can access and benefit from these innovations (Tulcanaza-Prieto et al., 2025; Singh & Karamcheti, 2025). Studies from both developed and developing countries confirm that digital literacy significantly moderates the effect of financial literacy on outcomes like savings behaviour, loan usage, and entrepreneurship (Hu & Liu, 2025; Rahman & Sadik, 2025). Those lacking digital skills—such as

Indigenous entrepreneurs or rural youth—face compounded barriers that limit both inclusion and resilience (Blue et al., 2025; Abdulkareem et al., 2025).

Effective behavioural interventions now integrate digital tools to amplify learning, personalise experiences, and provide real-time nudges. Gamified applications (Platz & Zauner, 2025), low-cost online courses (Clark et al., 2025), and mobile nudging platforms (Al-Afeef & Alsmadi, 2025) reflect how technology can transform passive learning into active behavioural change. Importantly, these interventions are also proving effective in reaching underserved populations, as they overcome traditional barriers of geography, cost, and institutional access. However, the digital divide remains a persistent concern, especially where infrastructure or digital readiness is low, highlighting the need for inclusive digital empowerment strategies.

Moreover, the behavioural implications of digital-financial synergy are profound. Digital skills boost financial self-efficacy and allow for deeper engagement with financial platforms, thereby promoting more informed and confident decision-making (Kim et al., 2025). Conversely, digital exclusion not only limits financial access but exacerbates socio-economic inequality. This duality suggests that digital literacy must be embedded into both financial education curricula and policy frameworks, particularly in the context of lifelong learning and financial resilience planning (Mustafa et al., 2025).

Despite progress, the effectiveness of behavioural interventions is often contingent on contextual and individual variables. Immediate gains in knowledge and attitude do not always lead to sustained behavioural transformation, especially without continued reinforcement or enabling environments (Gerrans et al., 2025). Therefore, behavioural strategies must be longitudinal, reinforcing, and adapted to the user's lifecycle and socio-economic status. Moreover, a one-size-fits-all approach may perpetuate exclusion, reinforcing the necessity for intersectional and inclusive policy designs that address gender, age, cultural context, and digital readiness. In conclusion, advancing financial literacy measurement and behavioural interventions requires an integrated, systemic approach that reflects both technological change and human behavioural complexity. This includes:

- Embedding behavioural theories in intervention design.
- Developing multidimensional assessment tools that reflect psychological, attitudinal, and digital factors.
- Promoting digital inclusion as an integral part of financial literacy programs.
- Tailoring interventions to diverse demographic and socio-economic contexts.

Such an approach will enhance financial inclusion and well-being, equipping individuals not only with knowledge but also with the behavioural tools and digital access required to navigate the modern financial landscape confidently and sustainably.

CONCLUSION

This study concludes that enhancing the measurement of financial literacy in the digital era requires a paradigm shift from conventional knowledge-based assessments to multi-dimensional frameworks that integrate digital literacy, behavioural intention, and contextual relevance. The main finding highlights that financial knowledge alone is insufficient to drive meaningful change in financial behaviour. Instead, outcomes are increasingly shaped by an individual's digital competence, confidence, behavioural predispositions, and social context. In particular, digital literacy has emerged as a critical moderating factor in translating financial literacy into tangible financial well-being.

Emerging trends reveal a strong alignment between financial education and behavioural theories such as the Theory of Planned Behaviour (TPB) and Theory of Reasoned Action (TRA). These frameworks shed light on how attitudes, subjective norms, and perceived behavioural control influence financial actions. Additionally, technological advancements, including gamified assessments, machine learning-based diagnostics, and mobile behavioural nudges, are redefining how financial knowledge is delivered, assessed, and acted upon, especially among youth, rural communities, and underserved populations. As a result, the measurement of financial literacy must now consider not only cognitive understanding but also digital access and behavioural intent.

From a policy perspective, these findings call for the development of integrated and context-sensitive financial literacy tools that address both financial and digital dimensions. Financial education programs should be designed with behavioural theory in mind, ensuring that they foster not only knowledge acquisition but also confidence, motivation, and real-world application. Policymakers must also prioritise inclusive digital empowerment, particularly in regions where the digital divide risks exacerbating financial exclusion. Cross-sector partnerships, among governments, educators, fintech innovators, and community-based organisations, are essential to develop and implement adaptive, scalable, and culturally responsive interventions.

However, this study is not without limitations. First, the analysis relied on a select corpus of recent peer-reviewed studies (mostly from 2024–2025) indexed in Scopus, which may not capture the full breadth of literature across regions and non-English sources. Second, while this review synthesises thematic insights from behavioural finance and digital inclusion, empirical testing of these interactions was beyond the study's scope. Moreover, heterogeneity in financial literacy definitions, measurement tools, and digital infrastructure across countries presents challenges in drawing universally applicable conclusions.

Recommendations

For future research, it is recommended to:

- Conduct longitudinal and cross-country studies that empirically examine the interaction between financial literacy, digital literacy, and behavioural outcomes over time.
- Develop and validate multi-dimensional assessment instruments that can measure financial capability in various socio-economic and cultural contexts.
- Investigate the effectiveness of integrated financial-digital literacy interventions on marginalised or digitally excluded populations, especially women, the elderly, and Indigenous communities.
- Explore the ethical and cognitive impacts of AI-driven financial literacy tools, including privacy risks, algorithmic bias, and user dependency on automated financial advice.

In summary, the future of financial inclusion and well-being lies not merely in enhancing what people know about finance but in ensuring they have the behavioural confidence, digital skills, and contextual support to apply that knowledge effectively. By rethinking how financial literacy is measured and taught through a behavioural and digital lens, stakeholders can better empower individuals and communities to make informed, resilient, and inclusive financial decisions.

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