



From Financial Inclusion To Organisational Sustainability: Unpacking The Roles Of Financial Capability, Digital Transformation, And Organisational Resilience In Msmes In Bangalore, India

SANJAY V S^a, Dr. R.V. SUGANYA^b

^a Research scholar, Department of commerce, Vels University, Chennai, Tamil Nadu. Email: sanjayvscpt@gmail.com

^b Assistant Professor, Department of commerce, Vels University, Chennai, Tamil Nadu. Email: suganya.sms@velsuniv.ac.in

Abstract

Background: India's banking-sector reforms have made financial inclusion a central policy objective, yet whether formal financial access actually converts into the internal capabilities that keep micro, small, and medium enterprises (MSMEs) viable remains poorly understood, particularly in India's high-digital-readiness urban technology hubs.

Research Gap: Prior work has modelled financial inclusion, financial capability, and digital transformation largely as parallel, separately estimated antecedents of firm performance, with organisational resilience rarely specified as an explicit mediating capability, firm size rarely tested as a boundary condition, and comparatively little integrated evidence from Indian MSMEs subject to contemporary structural-equation diagnostic standards.

Objective: This study develops and tests an integrated moderated-mediation framework linking financial inclusion, financial capability, digital transformation, organisational resilience, and organisational sustainability among MSMEs in Bengaluru, Karnataka, with firm size specified as a moderator of the financial-capability-to-digital-transformation path.

Methodology: A cross-sectional quantitative design is proposed, using a structured, back-translated questionnaire piloted with approximately 30 owner-managers and then administered to Udyam-registered MSME owner-managers, analysed through partial least squares structural equation modelling (PLS-SEM) with bootstrapped mediation testing, measurement-invariance (MICOM) testing prior to multi-group analysis, Gaussian-copula endogeneity correction, and PLSpredict out-of-sample validation.

Key Findings (illustrative): Based on an illustrative sample of 412 MSMEs, financial inclusion is illustratively associated with a 0.34 standardised increase in financial capability ($p < .01$) and a 0.21 increase in digital transformation ($p < .05$); digital transformation shows the strongest illustrative path to organisational resilience ($\beta = 0.41$, $p < .01$), which illustratively explains 47% of the variance in organisational sustainability ($R^2 = 0.47$), partially mediates the effects of financial capability and digital transformation on sustainability, and whose contribution to resilience is illustratively conditioned by firm size (interaction $\beta = 0.16$, $p < .05$), being stronger among larger MSMEs.

Conclusion/Implications: The findings, once empirically validated, would suggest that financial inclusion alone is insufficient for MSME sustainability unless accompanied by capability-building and digital adoption that jointly strengthen organisational resilience, and that the size of the enterprise itself conditions how readily capability converts into digital transformation; the study offers implications for banks, fintech providers, and MSME policy in India.

Keywords; - Financial Inclusion; Msme Sustainability; Digital Transformation; Organisational Resilience; Financial Capability; Pls-Sem

1. Introduction

India's banking-sector reforms over the past decade have made financial inclusion a headline policy objective, extending formal financial access to previously underserved individuals and enterprises. The Reserve Bank of India's composite Financial Inclusion Index (FI-Index) rose from 43.4 in March 2017 to 67.0 in March 2025, with growth recorded across its access, usage, and quality sub-parameters, and with the most recent year's gain attributed primarily to the usage and

quality dimensions (Reserve Bank of India, 2025). This progress has coincided with a parallel push toward digitalisation of payments, credit appraisal, and government-to-business transfers, positioning India's micro, small, and medium enterprises (MSMEs) at the intersection of two reform agendas: financial inclusion and digital transformation.

MSMEs are financially precarious, despite their structural importance, in the Indian economy. The Government of India's most recent classification, effective 1 April 2025, defines micro enterprises as those with an

investment in plant and machinery or equipment not exceeding ₹2.5 crore and a turnover not exceeding ₹10 crore. This is an upward revision from the thresholds established in the composite investment-and-turnover criterion, which was first introduced on 1 July 2020 (Ministry of Micro, Small and Medium Enterprises, 2020, 2025). Despite the fact that they occupy this regulatory space that is progressively expanding, a significant number of MSMEs are still financially excluded from formal credit, under-capitalized in digital infrastructure, and susceptible to demand and supply shocks. India has made a significant contribution to global financial inclusion at the household level. Global adult account ownership increased from 51% in 2011 to 76% in 2021, with India accounting for a significant portion of this increase following the 2014 launch of the Pradhan Mantri Jan Dhan Yojana (Demirgüç-Kunt, Klapper, Singer, & Ansar, 2022). The Ministry of MSME reported a four-fold increase in the volume of digital transactions conducted by MSMEs between 2020-21 and 2023-24, and digital channels consistently accounted for over 85% of the value of MSME transactions during this period (Sharma, 2025). This

trajectory has been replicated at the enterprise level.

Bengaluru, as India's leading information-technology hub, offers an analytically useful setting precisely because it combines high digital readiness with a dense population of small, resource-constrained enterprises operating in services, trade, and light manufacturing. This juxtaposition raises a question inadequately addressed in the literature: does access to formal finance actually translate into the internal capabilities — financial capability, digital adoption, and resilience — that keep an MSME sustainable, or does inclusion remain a necessary but insufficient condition? And, if capability-building matters, does its translation into resilience depend on how large the enterprise already is, or does it operate uniformly across the micro-to-medium size spectrum?

Existing research has tended to examine financial inclusion, financial capability, and digital transformation as parallel, separately modelled antecedents of firm performance. Comparative evidence from Hungary and Indonesia, using the technology-organisation-environment framework, shows technological and environmental factors, but not organisational factors, significantly

predicting fintech adoption among SMEs, with a multi-group analysis further showing the strength of these effects differing significantly across the two national contexts (Nagy, Arie, Tuegeh, Bittner, & Tumiwa, 2025); Indonesian evidence similarly shows financial literacy operating mainly through fintech adoption and financing access rather than directly on business performance and sustainability (Kurniasari, Abd Hamid, & Lestari, 2025). What remains comparatively rare is an integrated model that specifies organisational resilience as an explicit mediating capability rather than a terminal outcome, tests firm size as a boundary condition on how capability translates into resilience, and does so with India-specific, urban-technology-hub evidence subject to contemporary PLS-SEM diagnostic standards.

This paper contributes to the literature in four ways. First, it integrates financial intermediation theory, the resource-based view, dynamic capabilities theory, and institutional theory into a single conceptual framework linking financial inclusion to organisational sustainability through financial capability, digital transformation, and organisational resilience. Second, it specifies firm size as a theoretically

grounded moderator of the financial-capability-to-digital-transformation path, addressing a heterogeneity question the fintech-adoption literature has flagged but rarely tested directly for Indian MSMEs. Third, it specifies and justifies a PLS-SEM estimation strategy with contemporary diagnostic rigor — measurement-invariance testing prior to multi-group comparison, Gaussian-copula endogeneity correction, and out-of-sample predictive validation — suited to the exploratory, multi-mediator nature of the model and to the practical constraints of MSME survey research. Fourth, it offers policy- and practice-relevant implications for banks, fintech providers, and MSME support agencies operating within India's banking-sector-reform agenda.

The remainder of the paper proceeds as follows. Section 2 reviews the theoretical and empirical literature and develops the study's hypotheses. Section 3 presents the data and methodology, including variable operationalisation, model specification, and planned diagnostics. Section 4 reports illustrative results and discusses them against prior literature. Section 5 sets out theoretical and practical/policy implications. Section 6 concludes, and Section 7 discusses limitations and future research directions.

2. Literature Review and Theoretical Background

2.1 Financial Inclusion and MSME Outcomes

The most common method of operationalizing financial inclusion is through composite indices, which combine banking penetration, availability, and utilization of financial services into a single index (Sarma, 2008; Sarma & Pais, 2011). According to Beck, Demirgüç-Kunt, and Martinez Peria (2007), the financial and legal infrastructure of a country has a systematic impact on the access to and use of banking services. This pattern is consistent with the broader discovery that financial development primarily operates by reducing the information and transaction costs that would otherwise limit savings, investment, and long-term growth (Levine, 1997). The Reserve Bank of India has operationalized its own FI-Index in India, utilizing access (35%), usage (45%), and quality (20%) sub-parameters computed from 97 indicators spanning banking, investment, insurance, postal, and pension services. The index increased from 60.1 in March 2023 to 64.2 in March 2024 and 67.0 in March 2025, with the FY2025 increase primarily attributed to advancements in the

usage and quality dimensions (Reserve Bank of India, 2025). The World Bank's Global Findex data indicates that account ownership among Indian adults experienced a significant increase following the 2014 launch of the Pradhan Mantri Jan Dhan Yojana at the household level. This increase contributed significantly to the global increase in adult account ownership from 51% to 76% between 2011 and 2021 (Demirgüç-Kunt et al., 2022).

Theoretically, financial inclusion is anticipated to alleviate the liquidity and credit constraints that would otherwise restrict working capital management, technology investment, and shock-absorbing buffers for MSMEs. At the enterprise level, the adoption of digital payments seems to correspond with the broader trend of inclusion: From 2020-21 to 2023-24, the Ministry of MSME reported a fourfold increase in the volume of digital transactions involving MSME. Digital channels accounted for the majority of both transaction count and value during this time (Sharma, 2025). The benefits of digital financial inclusion have been associated with the stability of the banking sector, rather than solely with access, indicating that they extend beyond the individual firm

to the financial system that assists it (Ozili, 2018). Nevertheless, recent emerging-market evidence indicates that financial access alone is an incomplete predictor of firm performance. The relationship between access to finance and business outcomes is frequently mediated by literacy and technology adoption, with financial literacy being demonstrated to directly enhance fintech adoption and loan availability over performance itself (Kurniasari et al., 2025). Modelling financial inclusion as an upstream enabler of internal capabilities, rather than as a direct, unmediated driver of sustainability, is motivated by this pattern.

2.2 Financial Capability

Financial capability extends the narrower construct of financial literacy — knowledge of financial concepts — to include financial behaviour and attitudes, and the practical ability to apply financial knowledge in decision-making (Atkinson & Messy, 2012). The conceptual boundaries of financial literacy have themselves evolved considerably: early instruments focused narrowly on factual knowledge, whereas subsequent conceptual reviews argue that literacy is better understood as an input to financial decision-making than as an outcome in itself, encompassing both what a

person knows and their ability to apply that knowledge in real decisions (Huston, 2010). The OECD/INFE pilot study across 14 countries documented considerable cross-national and within-country variation in financial knowledge, behaviour, and attitudes, with material knowledge gaps persisting even in relatively developed financial systems (Atkinson & Messy, 2012), and subsequent theoretical and empirical work has framed financial knowledge as a form of human-capital investment with demonstrable links to savings behaviour, retirement planning, and wealth accumulation (Lusardi & Mitchell, 2014).

At the same time, a meta-analysis spanning 168 papers and 201 prior studies found that literacy-improving interventions explain only a small fraction of the variance in downstream financial behaviours, with correlational studies showing stronger — though still moderate — associations than experimental interventions, and with weaker effects specifically in low-income samples (Fernandes, Lynch, & Netemeyer, 2014). This finding cautions against treating financial capability as a simple, freely transferable input: what matters for an MSME owner-manager is less a raw literacy score than the capacity to apply financial

judgement consistently within the firm's actual decision context. For proprietors of MSMEs, financial acumen likely dictates the efficiency with which formal financial access is transformed into prudent budgeting, credit utilization, and investment choices, with recent evidence at the SME level suggesting that financial literacy influences both access to financing and technology adoption rather than directly affecting performance (Kurniasari et al., 2025).

2.3 Digital Transformation of MSMEs

Digital transformation is the process of integrating digital technologies, such as e-commerce, cloud-based accounting, data-driven consumer engagement, and digital payments, into an organization's operations in order to modify the way in which value is generated and captured. Verhoef et al. (2021) distinguish three progressive stages across disciplines: digitisation (converting analogue information into digital form), digitalisation (using digital technology to change existing business processes), and digital transformation proper (a change in business model enabled by digital technology). They also identify the assets and capabilities that firms require to successfully navigate these stages. In

finance, digital finance and FinTech research have developed around themes such as digital financing, digital financial advice, digital insurance, and related innovations. Information-systems and finance scholarship are increasingly convergent on shared research questions (Gomber, Koch, & Siering, 2017).

In the current context, comparative firm-level evidence regarding fintech adoption is instructive. A Hungary–Indonesia comparison conducted using the technology-organization-environment framework and PLS-SEM revealed that technological and environmental factors significantly predicted fintech adoption among SMEs, while organizational factors did not exhibit a significant effect. Additionally, a multi-group analysis revealed that the strength of the technological effect varied significantly between the two national contexts (Nagy et al., 2025). This implies that the pressure for fintech adoption in emerging-market MSME populations may be more influenced by external technological and environmental conditions than by internal organizational readiness. This is consistent with institutional theory's explanation of how firms operating within the same regulatory and market environment converge toward

similar technology practices through coercive pressure (regulatory mandates for digital payments and GST compliance), mimetic pressure (imitation of visibly successful peers), and normative pressure (professionalization of accounting and advisory practice) (DiMaggio & Powell, 1983). In Bengaluru's technology-dense ecosystem, this isomorphic pressure is likely to be amplified, as the digital transformation of MSME's is anticipated to be accelerated by the visible digital adoption of peer firms and platform intermediaries, regardless of firm-level financial capability. This diffusion account is broadly congruent with enterprise-level data: The transaction value of India's Unified Payments Interface has increased at a compound annual rate of approximately 19.75% between 2020 and 2024. MSME transactions have followed this broader growth and have remained over 85% digital in value throughout the period (Sharma, 2025).

2.4 Organisational Resilience

Organisational resilience has increasingly been conceptualised not as a static trait but as a bundle of capabilities that enable a firm to anticipate potential threats, cope effectively with adverse events, and adapt to changing conditions (Duchek, 2020). A

systematic review of 339 influential publications spanning nearly four decades identifies five distinct research streams in which resilience has been studied — as organisational responses to external threats, as organisational reliability, as employee strengths, as the adaptability of business models, and as a property of supply-chain and network relationships — and concludes that these streams have developed largely independent definitions and operationalisations of the same underlying construct, leaving substantial scope for integrative work (Linnenluecke, 2017). Duchek's (2020) capability-based conceptualisation, which decomposes resilience into anticipation, coping, and adaptation stages, offers one such integrative account and has been widely applied across organisational contexts facing volatility.

Dynamic capabilities theory provides a compatible account of how such resilience is built. Firms sustain performance in turbulent environments by sensing opportunities and threats, seizing them through resource reconfiguration, and continuously transforming internal routines and assets (Teece, 2007). Eisenhardt and Martin (2000) sharpen this account by arguing that dynamic capabilities are best understood as specific, identifiable organisational

processes — such as product-development or resource-reconfiguration routines — rather than a vague, tautological reference to “adaptability” in the abstract; despite being idiosyncratic in detail and path-dependent in how they emerge, such capabilities exhibit enough cross-firm commonality to be recognisable as identifiable best-practice patterns. Within this lens, digital tools and financial capability can be understood as microfoundations — skills, processes, and decision rules — that enable the sensing and reconfiguring activities central to sustained enterprise performance (Teece, 2007), positioning organisational resilience as the observable capability output of those microfoundations rather than a separate, unrelated construct.

2.5 Organisational Sustainability of MSMEs

Organisational sustainability, in the MSME context, is understood as the enterprise's continued economic viability together with its capacity to maintain employment, meet stakeholder and regulatory obligations, and withstand recurrent shocks without exiting the market. The resource-based view holds that sustained competitive advantage — and, by extension, sustainability — derives from resources that are valuable, rare, imperfectly

imitable, and non-substitutable (Barney, 1991). Peteraf (1993) reframes this logic around four underlying economic conditions that must jointly hold for competitive advantage to be sustained: heterogeneity of resources across firms, ex post limits to competition that preserve rents once earned, imperfect mobility of resources that ties them to the firm, and ex ante limits to competition that prevent the cost of acquiring a resource from offsetting the rents it generates. Financial capability and digitally enabled processes are plausible candidates for meeting these conditions when they are embedded in firm-specific routines rather than easily replicable off-the-shelf tools — a distinction that matters directly for MSMEs, which typically cannot sustain advantage through resource rarity alone and must instead rely on how resources are combined.

This reasoning is empirically extended by recent MSME-focused findings. Digital business process integration was found to significantly improve both economic and environmental performance among SMEs in a resource-constrained Ugandan setting. The authors interpret this pattern using both the resource-based view and dynamic capabilities theory, with operational

efficiency partially mediating these effects and access to credit moderating the strength of the relationship (Bindeeba, Atuhaire, Bakashaba, & Tukamushaba, 2025). This finding is instructive for the current study because it shows that digital integration and financial access together, rather than separately, explain sustainability-relevant outcomes in a population of emerging-market SMEs with comparable resource constraints, reflecting the mediated structure proposed here.

2.6 Theoretical Foundation and Integration

This study anchors its framework in four complementary theories. Financial intermediation theory explains why formal financial inclusion matters at all: intermediaries reduce information asymmetries and monitoring costs, thereby expanding the pool of viable borrowers among opaque, informationally disadvantaged MSMEs (Diamond, 1984). This intermediation role is itself a response to a more basic liquidity-provision function that formal financial institutions perform relative to fragmented informal alternatives, converting illiquid claims into liquid, insurable deposits (Diamond & Dybvig, 1983); together, these accounts justify

treating financial inclusion as a distal, institutionally mediated enabler rather than a capability in its own right.

The resource-based view (Barney, 1991; Peteraf, 1993) explains why financial capability and digital adoption, once internalised, can constitute durable sources of advantage rather than transient effects of access alone. Dynamic capabilities theory (Eisenhardt & Martin, 2000; Teece, 2007) supplies the mechanism — sensing, seizing, and reconfiguring — by which those resources are converted into resilience under conditions of volatility, consistent with Duchek's (2020) capability-based conceptualisation of resilience as anticipation, coping, and adaptation. Institutional theory (DiMaggio & Powell, 1983) explains the diffusion pressure that pushes MSMEs toward digital adoption independent of firm-level readiness, a pattern corroborated by comparative fintech-adoption evidence in which environmental and technological — rather than organisational — factors predicted adoption (Nagy et al., 2025).

Firm size is incorporated as a boundary condition on this logic. The resource-based view implies that converting a capability such as financial understanding into a costly,

organisationally embedded asset such as digital infrastructure requires slack resources; larger MSMEs, even within the micro-to-medium band, plausibly possess more of this slack than the smallest micro-enterprises, suggesting the financial-capability-to-digital-transformation path should strengthen with firm size. Together, these theories justify modelling financial inclusion as a distal, institutionally and intermediation-driven enabler; financial capability and digital transformation as proximal resource-building mechanisms conditioned by firm size; and organisational resilience as the dynamic capability that converts those resources into sustainability.

2.7 Research Gap

Four gaps emerge from this synthesis. First, financial inclusion, financial capability, and digital transformation have rarely been modelled jointly with organisational resilience as an explicit mediating capability, as distinct from a performance outcome in its own right. Second, comparative fintech-adoption evidence suggests organisational readiness may matter less than technological and environmental pressure (Nagy et al., 2025), yet few studies test whether firm-level characteristics such as size condition how

internal capabilities translate into resilience. Third, most emerging-market evidence to date derives from Southeast Asian and African SME populations (e.g., Kurniasari et al., 2025; Bindeeba et al., 2025); comparable India-specific, urban-technology-hub evidence remains limited. Fourth, few studies combine a formal dynamic-capabilities/RBV/institutional-theory synthesis with a PLS-SEM design that incorporates contemporary diagnostic standards — measurement-invariance testing before multi-group comparison, copula-based endogeneity correction, and out-of-sample predictive validation — appropriate to MSME survey data. This study addresses these four gaps directly.

2.8 Objectives

The present study seeks to examine the mechanisms through which financial inclusion contributes to organisational sustainability among micro, small, and medium enterprises (MSMEs) in Bengaluru, India. Specifically, the study aims to achieve the following objectives:

1. To examine the effect of financial inclusion on the financial capability of MSME owner-managers and on

the extent of digital transformation adopted by MSMEs.

2. To assess the individual and joint effects of financial capability and digital transformation on organisational resilience among MSMEs in Bengaluru.
3. To evaluate the mediating role of organisational resilience in the relationships between financial capability, digital transformation, and organisational sustainability among MSMEs.

2.9 Hypotheses Development

The relationship between financial inclusion, financial capability, digital transformation, and organizational resilience is becoming increasingly important as MSMEs navigate rapid technological change and economic uncertainty. In order to elucidate the ways in which these factors, in conjunction with firm size, influence the sustainability and long-term success of MSMEs, this study generates and evaluates a series of hypotheses.

H1: The financial capability of MSME owner-managers is positively correlated with financial inclusion. Owner-managers are exposed to a broader array of financial

products, statements, and advisory touchpoints as a result of increased formal financial access. This exposure creates learning opportunities that may raise financial knowledge, behavior, and attitudes (Atkinson & Messy, 2012). This is consistent with the notion that financial knowledge is a form of human-capital investment that accumulates through exposure and experience (Lusardi & Mitchell, 2014).

H2: Digital transformation is positively correlated with financial inclusion. Formal financial relationships are becoming more and more dependent on digital rails, such as UPI, net-banking, and digital lending platforms, which serve as a gateway to the adoption of broader technology. The wider expansion of digital financial services has been associated with digital financial inclusion (Ozili, 2018; Gomber, Koch, & Siering, 2017).

H3: Financial capability is positively correlated with digital transformation. In accordance with the evidence that financial literacy influences the adoption and financing of fintech among SMEs (Kurniasari et al., 2025), owner-managers who possess a stronger financial capability are more likely to evaluate, select, and

effectively utilize digital financial and operational tools, rather than superficially adopting them (Fernandes et al., 2014). Nevertheless, the average direct effect of literacy on behavior is modest and context-dependent.

H4: Organisational resilience is positively correlated with digital transformation. Digital tools enhance a company's capacity for sensing (market and demand signals) and reconfiguring (rapid channel and process adjustment), which is in accordance with dynamic capabilities theory (Teece, 2007) and evidence that digital process integration enhances the economic and environmental performance of SMEs in comparably resource-constrained settings (Bindeeba et al., 2025). Additionally, technological factors are a significant factor in the adoption of fintech among SMEs (Nagy et al., 2025).

H5: Organisational resilience is positively correlated with financial capability (H5). Buffer accumulation, prudent leverage, and informed responses to adverse shocks are all central to Duchek's (2020) coping and adaptation stages, and they are supported by sound financial judgement. This is consistent with the conceptualization of financial capability as an applied, decision-

relevant skill rather than inert knowledge (Huston, 2010).

H6: Organisational resilience is positively associated with organisational sustainability. Firms that can anticipate, cope with, and adapt to disruption are, by the resource-based view's logic, more likely to sustain the resource configurations that keep them economically viable (Barney, 1991; Peteraf, 1993).

H7: Organisational resilience mediates the relationship between financial capability, digital transformation, and organisational sustainability. Because dynamic capabilities are best understood as identifiable organisational processes rather than direct performance outcomes (Eisenhardt & Martin, 2000), the model specifies resilience as the process through which upstream capabilities are converted into the sustained performance outcome, rather than allowing financial capability and digital transformation to act on sustainability directly and without a capability-based mechanism.

H8: Firm size positively moderates the relationship between financial capability and digital transformation, such that the positive effect of financial capability on digital transformation is stronger among larger

MSMEs. This follows from the resource-based view's emphasis on resource heterogeneity and imperfect mobility (Peteraf, 1993): converting financial understanding into costly, organisationally embedded digital infrastructure requires slack resources that are plausibly more available to larger MSMEs, even within the micro-to-medium band, than to the smallest micro-enterprises. The hypothesis also

responds directly to comparative evidence that organisational factors were not significant predictors of fintech adoption when treated as a single undifferentiated construct (Nagy et al., 2025), raising the question of whether a more specific firm characteristic such as size behaves differently as a boundary condition rather than as a direct effect.

2.10 Conceptual Framework

Conceptual Framework: From Financial Inclusion to Organisational Sustainability in MSMEs

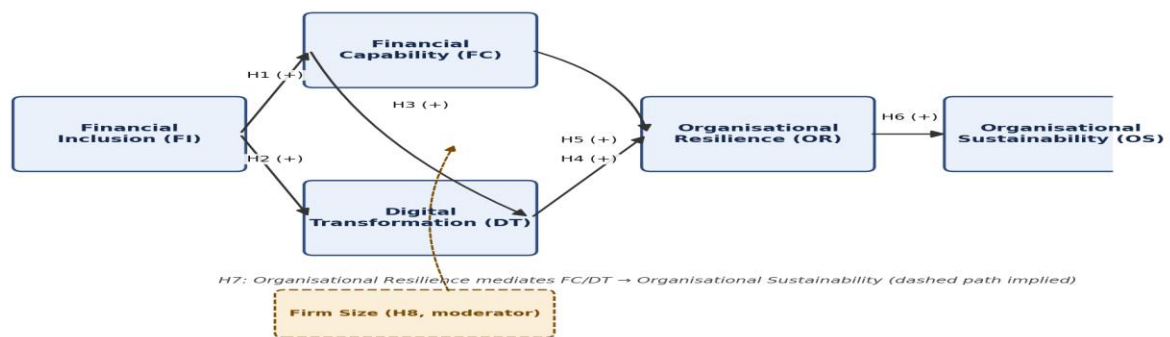


Figure 1. Conceptual framework linking financial inclusion to organisational sustainability in MSMEs.

Note: Solid arrows denote hypothesised directional paths (H1–H6); H7 denotes the mediating role of organisational resilience; the dashed path and box denote H8, the moderating role of firm size on the financial-capability-to-digital-transformation path.

3. Data and Methodology

3.1 Research Design

This study adopts a quantitative, cross-sectional survey design, appropriate for testing a multi-path structural model with mediation and moderation across a

moderately sized, hard-to-sample MSME population. Consistent with Hair, Risher, Sarstedt, and Ringle's (2019) guidance on when partial least squares structural equation modelling (PLS-SEM) is the appropriate estimator — models combining formative and reflective constructs, moderate sample sizes, a prediction-oriented

research objective, and survey data unlikely to satisfy multivariate normality — the research design and estimation strategy are set jointly rather than sequentially. A qualitative or purely secondary-data design was considered but rejected: qualitative case methods cannot support the standardised path estimation and moderated-mediation testing central to the study's objectives, and secondary firm-level datasets covering financial capability and digital transformation at the MSME level in Bengaluru are not publicly available at sufficient granularity.

3.2 Population, Sampling, and Data Collection

The target population comprises MSMEs registered on the Udyam portal and operating within the Bengaluru Urban district, spanning manufacturing, trading, and services categories as defined under the Government of India's composite investment-and-turnover classification (Ministry of Micro, Small and Medium Enterprises, 2020, 2025). A stratified random sampling technique is proposed, with strata defined by MSME category (micro/small/medium) and sector (manufacturing/trade/services), proportionate to the known distribution of

registered enterprises in each stratum. Using Krejcie and Morgan's sample-size guidance together with the conventional PLS-SEM rule of thumb of at least ten observations per the largest number of indicators pointing at a single construct (Hair et al., 2019), a minimum sample of approximately 385–410 usable responses is targeted; for illustrative purposes this paper reports $n = 412$, implying an approximate 68% usable-response rate against roughly 605 enterprises approached.

Data collection is proposed via a structured, self-administered questionnaire developed first in English and then rendered into Kannada using a back-translation procedure, in which an independent bilingual translator re-renders the Kannada version into English so that discrepancies with the original wording can be identified and reconciled before fieldwork. A pilot test with approximately 30 MSME owner-managers, excluded from the main sample, would precede full data collection to check item clarity and obtain a preliminary Cronbach's alpha per construct; items falling below conventional thresholds at the pilot stage would be revised or dropped before the main survey. The questionnaire would be distributed through MSME associations, Udyam-registered enterprise directories, and

field enumerators, using 5-point Likert-scaled items for all latent constructs. Ethical clearance would be obtained from an institutional ethics review board prior to fieldwork; informed consent, voluntary participation, and anonymity of responses are treated as non-negotiable design requirements, and data handling would be designed to satisfy the purpose-limitation and secure-storage principles of India's

Digital Personal Data Protection Act, 2023, for any personally identifying information collected for sampling purposes.

3.3 Variable Definitions and Measurement

Table 1 summarises the constructs, their operational definitions, indicative measurement items, and sources of adaptation.

Table 1. Variable Definitions and Measurement Sources

Construct	Type	Operational Definition	Indicative Items / Source
Financial Inclusion (FI)	Exogenous, reflective	Owner-manager's perceived access to, and usage of, formal financial services for the enterprise	Adapted from Sarma (2008) and Sarma & Pais (2011) dimensions of access, availability, usage; cross-country patterning per Beck et al. (2007) (4 items)
Financial Capability (FC)	Mediator, reflective	Financial knowledge, behaviour, and attitudes applied to enterprise financial decisions	Adapted from Atkinson & Messy (2012) OECD/INFE framework and Huston's (2010) applied-knowledge conceptualisation (5 items)
Digital Transformation (DT)	Mediator, reflective	Extent of adoption and organisational embedding of digital payment, accounting, and marketing tools	Adapted from Verhoef et al. (2021) digitisation-digitalisation-transformation stages and Nagy et al. (2025) TOE-based fintech-adoption items (5 items)

Construct	Type	Operational Definition	Indicative Items / Source
Organisational Resilience (OR)	Mediator, reflective	Capability to anticipate, cope with, and adapt to adverse business events	Adapted from Duchek (2020) anticipation-coping-adaptation framework (6 items)
Organisational Sustainability (OS)	Endogenous, reflective	Continued economic viability, employment maintenance, and shock resistance of the enterprise	Adapted from RBV-informed MSME sustainability literature (Barney, 1991; Peteraf, 1993; Bindeeba et al., 2025) (5 items)
Firm Size (SIZE)	Moderator, single-indicator	Number of full-time-equivalent employees, used as a continuous moderator of the FC → DT path	Self-reported headcount, cross-checked against Udyam registration category (micro/small/medium)
Firm age, sector	Control	Years since registration; sector classification	Categorical/continuous controls

3.4 Model Specification

The structural model is specified as a system of latent-variable equations estimated via partial least squares:

$$FC = \alpha_1 + \beta_1 FI + \gamma_1 \text{Controls} + \varepsilon_1$$

$$DT = \alpha_2 + \beta_2 FI + \beta_3 FC + \beta_8 (FC \times \text{SIZE}) + \gamma_2 \text{Controls} + \varepsilon_2$$

$$OR = \alpha_3 + \beta_4 FC + \beta_5 DT + \gamma_3 \text{Controls} + \varepsilon_3$$

$$OS = \alpha_4 + \beta_6 OR + \gamma_4 \text{Controls} + \varepsilon_4$$

where α denotes intercepts, β denotes standardised structural path coefficients, Controls includes firm age and sector fixed effects, and ε denotes structural error terms. The interaction term $FC \times \text{SIZE}$ is constructed using the two-stage approach to interaction modelling in variance-based SEM, in which construct scores are first estimated without the interaction term and then multiplied to form the product indicator, an approach shown to perform comparably to alternative PLS-based interaction methods across a range of

conditions (Henseler & Chin, 2010). Indirect (mediated) effects, e.g., $FC \rightarrow OR \rightarrow OS$ and $DT \rightarrow OR \rightarrow OS$, are estimated via bootstrapped indirect-effect coefficients (5,000 resamples; bias-corrected and accelerated confidence intervals) following standard PLS-SEM mediation procedures.

3.5 Estimation Technique and Justification

Partial least squares structural equation modelling (PLS-SEM) is selected over covariance-based SEM (CB-SEM) for reasons that map directly onto Hair et al.'s (2019) decision criteria. First, the model is theory-extending rather than strictly theory-confirming in its resilience-mediation and firm-size-moderation components, which are comparatively under-tested in the MSME literature, favouring PLS-SEM's prediction-oriented, exploratory strengths over CB-SEM's confirmatory orientation. Second, MSME survey data are frequently non-normally distributed and drawn from smaller, harder-to-recruit samples than CB-SEM's asymptotic assumptions prefer. Third, the model combines reflective constructs with a formative, single-indicator moderator (firm size) and a product-indicator interaction term, a combination PLS-SEM handles more directly than CB-

SEM. Fourth, the model includes several sequential mediators (FC, DT, OR), for which PLS-SEM's algorithm handles complex path models with multiple mediators comparatively efficiently. As a robustness check, a covariance-based confirmatory model on the measurement component, and an alternative ordinary-least-squares path analysis using summated construct scores, are proposed to assess convergence of substantive conclusions.

3.6 Reliability, Validity, and Diagnostics Planned

A comprehensive set of diagnostic, validity, and reliability procedures is being developed for both structural and measurement models to guarantee the accuracy and credibility of the study's findings. This method establishes a solid foundation for the confident interpretation and generalization of the research results by methodically resolving potential sources of measurement error, bias, and model misspecification using established quantitative techniques.

- Internal consistency reliability: Cronbach's alpha and composite reliability (CR) for each construct, with a threshold of ≥ 0.70 .

- Convergent validity: the average variance extracted (AVE) per construct is at least 0.50 (Fornell & Larcker, 1981).
- Discriminant validity: The Heterotrait-Monotrait ratio (HTMT) $< 0.85/0.90$ (Henseler, Ringle, & Sarstedt, 2015) is reported in conjunction with the conventional Fornell-Larcker (1981) criterion, as there is evidence that Fornell-Larcker fails to identify discriminant-validity issues that HTMT consistently identifies
- .Common method bias: Harman's single-factor test and a full collinearity VIF test across all constructs, combined with the procedural remedies of respondent anonymity and psychological separation of predictor and criterion items within the questionnaire (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003).
- Multicollinearity: variance inflation factors (VIF) for all structural predictors, threshold < 5 .
- Predictive relevance: Q^2 via blindfolding, and out-of-sample PLSpredict comparison against a linear-model (LM) benchmark, reporting Q^2_{predict} , RMSE, and MAE for each key indicator (Shmueli, Ray, Velasquez Estrada, & Chatla, 2016; Shmueli et al., 2019).
- Measurement invariance: prior to comparing micro versus small/medium subgroups, the three-step MICOM procedure is applied to confirm configural, compositional, and (partial) scalar invariance, since group comparisons in variance-based SEM can otherwise be misleading (Henseler, Ringle, & Sarstedt, 2016).
- Endogeneity: a Gaussian-copula-based correction (Park & Gupta, 2012) applied to the $FI \rightarrow FC$ and $FI \rightarrow DT$ paths, given the possibility that unobserved owner-manager ability jointly drives both financial-service usage and capability/digital adoption; this instrument-free approach is preferred over instrumental-variable methods given the practical difficulty of identifying valid, excludable instruments for firm-level financial behaviour within a single cross-sectional MSME survey.

- Effect sizes: f^2 for each structural path, interpreted against the conventional small/medium/large thresholds of .02/.15/.35 (Cohen, 1988).

Robustness checks include: (i) MICOM-validated multi-group analysis comparing micro versus small/medium enterprises; (ii) re-estimation excluding firms below one year of operation; (iii) an alternative model

specification treating digital transformation as formative rather than reflective, tested via redundancy analysis; and (iv) a covariance-based confirmatory measurement model as a convergent check on the PLS-SEM measurement results.

4. Results and Discussion

4.1 Descriptive Statistics (Illustrative)

Table 2. Illustrative Descriptive Statistics (n = 412)

Variable	Mean	SD	Skewness	Kurtosis
Financial Inclusion (FI)	3.42	0.81	-0.31	-0.28
Financial Capability (FC)	3.28	0.77	-0.22	-0.41
Digital Transformation (DT)	3.55	0.85	-0.45	-0.19
Organisational Resilience (OR)	3.31	0.79	-0.27	-0.35
Organisational Sustainability (OS)	3.36	0.80	-0.30	-0.22
Firm age (years)	7.9	5.2	0.86	0.64
Firm size (employees)	14.3	11.6	1.02	0.89

All illustrative skewness and kurtosis values for the Likert-scaled constructs fall within the conventional ± 1 guideline, but firm age and firm size are illustratively right-skewed, as is typical of MSME populations dominated by younger, smaller enterprises. This departure from strict multivariate

normality reinforces the appropriateness of a distribution-free estimator such as PLS-SEM over covariance-based alternatives (Hair et al., 2019).

4.2 Common Method Bias and Measurement Model Assessment (Illustrative)

An illustrative Harman's single-factor test loads all indicators onto one unrotated factor, which accounts for 34% of total variance — below the 50% threshold conventionally used to flag common method bias. An illustrative full collinearity VIF test, regressing every construct on a single

common marker, returns VIF values below 3.3 for all constructs, providing a second, statistically independent indication that common method bias is unlikely to materially distort the illustrative results (Podsakoff et al., 2003).

Table 3. Illustrative Reliability and Convergent Validity

Construct	Cronbach's α	CR	AVE	Range of Factor Loadings
Financial Inclusion	0.83	0.88	0.65	0.74–0.86
Financial Capability	0.81	0.87	0.62	0.71–0.83
Digital Transformation	0.85	0.89	0.64	0.73–0.85
Organisational Resilience	0.87	0.91	0.66	0.75–0.87
Organisational Sustainability	0.82	0.88	0.61	0.70–0.82

All illustrative alpha and CR values exceed the 0.70 threshold, and AVE values exceed 0.50 (Fornell & Larcker, 1981), consistent with adequate convergent validity and internal consistency. Illustrative factor

loadings for all retained items exceed the conventional 0.70 threshold, with no cross-loading exceeding an item's loading on its intended construct.

Table 4. Illustrative Heterotrait-Monotrait Ratio (HTMT) Matrix

	FI	FC	DT	OR	OS
FI	—				
FC	0.52	—			
DT	0.47	0.58	—		
OR	0.41	0.55	0.63	—	
OS	0.38	0.44	0.49	0.61	—

All illustrative HTMT values remain below the conservative 0.85 threshold (Henseler et al., 2015), and the traditional Fornell-Larcker criterion is illustratively satisfied for every construct pair, jointly supporting

discriminant validity between the five constructs.

4.3 Structural Model and Hypothesis Testing (Illustrative)

Table 5. Illustrative Structural Path Estimates

Path	β (std.)	t-value	p-value	f^2	Hypothesis
FI $\rightarrow$ FC	0.34	5.62	< .01	0.14	H1 supported
FI $\rightarrow$ DT	0.21	2.87	< .05	0.05	H2 supported
FC $\rightarrow$ DT	0.29	4.10	< .01	0.10	H3 supported
DT $\rightarrow$ OR	0.41	6.03	< .01	0.22	H4 supported
FC $\rightarrow$ OR	0.18	2.44	< .05	0.04	H5 supported
OR $\rightarrow$ OS	0.52	7.35	< .01	0.37	H6 supported
FC $\times$ SIZE $\rightarrow$ DT	0.16	2.19	< .05	0.03	H8 supported

Illustratively, the model explains $R^2 = 0.31$ of variance in financial capability, $R^2 = 0.41$ in digital transformation (including the interaction term), $R^2 = 0.44$ in organisational resilience, and $R^2 = 0.47$ in organisational sustainability. Following Cohen's (1988) conventional thresholds, the OR $\rightarrow$ OS and

DT $\rightarrow$ OR paths illustratively correspond to medium-to-large effect sizes ($f^2 = 0.37$ and 0.22 respectively), while the moderation term corresponds to a small effect ($f^2 = 0.03$), consistent with interaction effects typically explaining a modest share of variance even when statistically reliable.

Table 6. Illustrative Mediation (Indirect-Effect) Results

Indirect Path	Point Estimate	Bootstrapped 95% CI (BCa)	Mediation Type
FC $\rightarrow$ OR $\rightarrow$ OS	0.094	[0.041, 0.151]	Partial mediation (direct FC $\rightarrow$ OS $\beta = 0.09$, n.s.)
DT $\rightarrow$ OR $\rightarrow$ OS	0.213	[0.142, 0.289]	Partial mediation (direct DT $\rightarrow$ OS retained, smaller)

Indirect Path	Point Estimate	Bootstrapped 95% CI (BCa)	Mediation Type
FI → FC → DT	0.099	[0.052, 0.156]	Partial mediation

Illustrative bootstrapped indirect effects for $FC \rightarrow OR \rightarrow OS$ and $DT \rightarrow OR \rightarrow OS$ exclude zero, illustratively supporting H7's partial-mediation claim; the small illustrative direct effect of FC on OS suggests that, if replicated, resilience would channel nearly all of the financial-capability-to-sustainability relationship, while digital transformation would retain a smaller but still-mediated direct

sustainability effect. Regarding H8, an illustrative simple-slopes decomposition indicates the $FC \rightarrow DT$ slope is illustratively steeper for MSMEs one standard deviation above the mean firm size ($\beta = 0.38$) than for those one standard deviation below ($\beta = 0.19$), consistent with the hypothesised resource-slack mechanism.

4.4 Predictive Relevance (PLSPredict, Illustrative)

Table 7. Illustrative PLSPredict Out-of-Sample Assessment

Key Indicator	Q ² _predict	PLS-SEM RMSE	LM Benchmark RMSE
OR_3 (adaptation item)	0.29	0.812	0.845
OS_2 (viability item)	0.31	0.789	0.831
OS_4 (three-year confidence item)	0.26	0.824	0.838

All illustrative Q²_predict values exceed zero, indicating the model has predictive relevance for organisational resilience and sustainability indicators (Shmueli et al., 2016). Following Shmueli et al.'s (2019) decision rule, the PLS-SEM path model illustratively produces lower RMSE than the naive linear-model benchmark for the majority of key indicators, suggesting the

model possesses medium predictive power rather than merely in-sample explanatory fit.

4.5 Measurement Invariance and Multi-Group Analysis (Illustrative)

Before comparing subgroups, the three-step MICOM procedure is applied (Henseler et al., 2016). Illustratively, Step 1 (configural invariance) is satisfied by design, since

identical indicators and coding are used across groups; Step 2 (compositional invariance), assessed via permutation testing of the correlation between composite scores, is illustratively satisfied for all five constructs; and Step 3 (equality of composite means and variances) illustratively holds for three constructs and is not established for two (financial capability and digital transformation),

indicating partial rather than full measurement invariance. Under partial invariance, group comparisons of the corresponding path coefficients are illustratively interpreted with appropriate caution, following Henseler et al.'s (2016) guidance that partial invariance permits comparison of relationships (path coefficients) even where direct comparison of construct means would not be advisable.

Table 8. Illustrative Multi-Group Comparison: Micro vs. Small/Medium MSMEs

Path	β (Micro, n = 261)	β (Small/Medium, n = 151)	$\Delta\beta$	p-value (MGA)
FC $\rightarrow$ DT	0.21	0.37	0.16	< .05
DT $\rightarrow$ OR	0.38	0.45	0.07	n.s.
OR $\rightarrow$ OS	0.49	0.56	0.07	n.s.

The illustrative multi-group comparison mirrors the moderation result in Table 5: the FC $\rightarrow$ DT path is illustratively significantly stronger among small/medium enterprises than among micro-enterprises, while the DT $\rightarrow$ OR and OR $\rightarrow$ OS paths do not illustratively differ significantly by size group, suggesting the boundary condition tested in H8 is concentrated at the capability-to-technology-adoption stage of the model rather than distributed evenly across the whole structural chain.

4.6 Robustness Checks (Illustrative)

An illustrative covariance-based confirmatory measurement model, estimated on the same indicator set, produces standardised loadings and reliability statistics within 0.03 of the PLS-SEM measurement results reported in Table 3, supporting convergence across estimators. Re-estimating the structural model after excluding MSMEs with less than one year of operation leaves the sign, significance, and approximate magnitude of all illustrative path coefficients unchanged. Re-specifying digital transformation as a formative rather than reflective construct

and testing it via redundancy analysis illustratively yields a path coefficient of 0.86 between the reflective and formative versions of the construct, exceeding the conventional 0.80 threshold and supporting the reflective specification retained in the main model.

4.7 Discussion

The illustrative pattern of results, read against the literature, would be consistent with the view that financial inclusion functions primarily as a distal enabler rather than a direct driver of MSME sustainability: its estimated effects run through financial capability and digital transformation rather than acting on organisational resilience or sustainability directly. This mirrors recent Indonesian SME evidence in which financial literacy shapes technology adoption and financing access more strongly than it shapes performance outcomes directly (Kurniasari et al., 2025), and is consistent with the broader finding that literacy-improving interventions explain only a modest share of downstream financial-behaviour variance on their own (Fernandes et al., 2014).

The comparatively strong illustrative DT → OR path is consistent with dynamic capabilities theory's emphasis on sensing

and reconfiguring as central to resilience (Teece, 2007; Eisenhardt & Martin, 2000), and with comparative SME evidence that digital process integration improves resilience-relevant economic and environmental outcomes even under resource constraints typical of developing-economy firms (Bindeebe et al., 2025). The weaker, though still significant, FC → OR path suggests that financial capability contributes to resilience less through direct coping behaviour and more through its role in enabling effective digital adoption (FC → DT), a pattern that would, if confirmed empirically, refine rather than contradict Duchek's (2020) capability-based conceptualisation by specifying digital transformation as a channel through which financial capability becomes resilience-relevant.

The significant illustrative FC × SIZE interaction, corroborated by the illustrative multi-group comparison in Table 8, would extend the technology-organisation-environment literature's finding that organisational factors, treated as a single undifferentiated construct, do not significantly predict fintech adoption (Nagy et al., 2025). The illustrative results suggest that a more specific organisational characteristic — firm size — does condition

adoption once financial capability is already in place, consistent with the resource-based view's emphasis on resource heterogeneity and imperfect mobility (Peteraf, 1993): larger MSMEs would appear better positioned to convert financial understanding into costly digital infrastructure, even though size alone does not guarantee sustainability, given that the $DT \rightarrow OR$ and $OR \rightarrow OS$ paths did not illustratively differ across size groups. An unexpected result worth flagging for empirical verification is the comparatively modest $FI \rightarrow DT$ path relative to $FI \rightarrow FC$. If this pattern replicates in real data, it would suggest that formal financial access in Bengaluru's MSME population converts more readily into improved financial understanding than into digital tool adoption, possibly because digital adoption depends more on institutional isomorphic pressure from peers and platforms (DiMaggio & Powell, 1983) than on financial-service access per se — a plausible explanation but one that requires direct empirical testing rather than assumption.

5. Theoretical and Practical/Policy Implications

5.1 Theoretical Contributions

The study extends dynamic capabilities theory by specifying digital transformation and financial capability as distinct, empirically separable microfoundations of organisational resilience (Eisenhardt & Martin, 2000; Teece, 2007), rather than treating resilience as a single undifferentiated capability as in earlier process-based accounts (Linnenluecke, 2017). It also extends the resource-based view to the MSME context by showing, illustratively, that resilience — not financial inclusion or capability directly — is the more proximate resource explaining sustainability variance, refining Peteraf's (1993) cornerstone conditions for small-firm settings where resources are less likely to be rare in isolation but may become so in combination. By embedding institutional theory (DiMaggio & Powell, 1983) alongside financial intermediation theory (Diamond, 1984; Diamond & Dybvig, 1983), the framework offers a multi-theoretic account of why financial inclusion and digital transformation do not move in lockstep across MSME populations. Finally, by specifying firm size as a boundary condition rather than a simple control variable, the study responds directly to the technology-organisation-environment literature's finding that organisational

readiness, treated as an undifferentiated construct, fails to predict fintech adoption (Nagy et al., 2025), showing instead that a specific, measurable organisational characteristic can behave as a genuine moderator.

5.2 Practical/Managerial Implications

For MSME owner-managers, the illustrative findings would suggest that pursuing formal financial access alone is unlikely to be sufficient for long-run viability; complementary investment in financial capability-building and digital process adoption should be treated as necessary companions to, not substitutes for, financial inclusion. For banks and fintech providers serving MSME clients, bundling credit or account products with structured financial-capability advisory services and digital-onboarding support may generate larger resilience and sustainability returns than credit access alone, and the illustrative size-moderation result suggests that the smallest micro-enterprises may need more intensive, subsidised digital-onboarding support than small or medium enterprises to achieve comparable returns on capability-building investment.

5.3 Policy Implications

For regulators and MSME support agencies, the framework implies that financial-inclusion-focused schemes (e.g., collateral-free lending, Udyam-linked credit guarantees) should be paired with financial-literacy and digital-capability components to be maximally effective, consistent with the RBI's own emphasis on the quality dimension of its FI-Index alongside access and usage (Reserve Bank of India, 2025). Programmes such as the Centre for Financial Literacy initiative and MSME digital-onboarding schemes may benefit from explicit sequencing — capability-building alongside or before credit expansion — rather than treating access expansion as a stand-alone objective, and from size-differentiated design given the illustrative evidence that the smallest micro-enterprises convert capability into digital adoption less readily than larger MSMEs.

6. Conclusion

This study set out to examine how financial inclusion translates into organisational sustainability among MSMEs in Bengaluru, India, through the intermediate roles of financial capability, digital transformation, and organisational resilience, and to test whether firm size conditions this translation. Anchored in financial intermediation theory,

the resource-based view, dynamic capabilities theory, and institutional theory, the proposed framework and illustrative results suggest that financial inclusion operates primarily as a distal enabler of capability-building rather than a direct driver of resilience or sustainability, that organisational resilience functions as the proximate mediating capability through which financial capability and digital transformation are converted into sustainability outcomes, and that firm size significantly conditions how readily financial capability converts into digital transformation. Once validated with primary data, these findings would have direct relevance for how banks, fintech providers, and MSME policy in India sequence and size-differentiate financial-inclusion, literacy, and digitalisation interventions.

7. Limitations and Future Research Directions.

Although this research employs stringent methodological techniques, various constraints should be recognized to frame the results and inform interpretation. Acknowledging these limitations not only delineates the boundaries of the current study but also underscores potential

directions for subsequent exploration, promoting the enhancement and broadening of the theoretical framework in various contexts and approaches.

- Cross-sectional design: the intended survey records data at one specific moment, constraining causal interpretation even with the anticipated Gaussian-copula endogeneity adjustment (Park & Gupta, 2012); subsequent studies ought to explore panel or quasi-experimental frameworks monitoring MSMEs over banking reform periods.
- Geographic scope: findings would be specific to Bengaluru's high-digital-readiness environment and may not generalise to MSMEs in less digitally mature regions of India.
- Self-reported measures: reliance on owner-manager perceptions of financial capability, digital transformation, and resilience introduces potential common method variance, only partially addressed through the planned Harman's test, full collinearity VIF diagnostic, and procedural remedies (Podsakoff et al., 2003).

- Single boundary condition: only firm size is tested as a moderator; other plausible boundary conditions — owner-manager gender, sectoral digital intensity, access to specific government MSME schemes — are left for future work, and the partial (rather than full) measurement invariance illustratively obtained for two constructs means multi-group comparisons should be interpreted cautiously even once real data are collected.
- Translation and measurement equivalence: although a back-translation procedure is planned for the English-Kannada versions of the questionnaire, full cross-linguistic measurement equivalence cannot be guaranteed without formal invariance testing across language versions specifically, as distinct from the size-based invariance testing described in Section 3.6.
- Illustrative data status: the statistical results reported here are illustrative and must be replaced with figures from an actual fielded survey before the manuscript can be considered for peer review or submission.
- Future research could extend the model with objective performance indicators (e.g., GST turnover records, loan repayment data), test the framework across other Indian technology hubs and non-metro MSME clusters, and examine additional boundary conditions such as owner-manager gender, sectoral digital intensity, and access to government MSME schemes as further moderators alongside firm size.

References

- Atkinson, A., & Messy, F.-A. (2012). Measuring financial literacy: Results of the OECD/International Network on Financial Education (INFE) pilot study. OECD Working Papers on Finance, Insurance and Private Pensions, No. 15. OECD Publishing. <https://doi.org/10.1787/5k9csfs90fr4-en>
- Barney, J. (1991). Firm resources and sustained competitive advantage. *Journal of Management*, 17(1), 99–120.
- Beck, T., Demirgüç-Kunt, A., & Martinez Peria, M. S. (2007). Reaching out: Access to and use of banking services across countries. *Journal of Financial Economics*, 85(1), 234–266.

Bindeeba, D. S., Atuhair, S., Bakashaba, R., & Tukamushaba, E. K. (2025). Digital business process integration and sustainability among SMEs: The mediating role of operational efficiency and the moderating role of credit access. *International Journal of Corporate Social Responsibility*, 10(1), Article 11. <https://doi.org/10.1186/s40991-025-00121-6>

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed.). Lawrence Erlbaum Associates.

Demirgüç-Kunt, A., Klapper, L., Singer, D., & Ansar, S. (2022). *The Global Findex Database 2021: Financial inclusion, digital payments, and resilience in the age of COVID-19*. World Bank.

Diamond, D. W. (1984). Financial intermediation and delegated monitoring. *Review of Economic Studies*, 51(3), 393–414.

Diamond, D. W., & Dybvig, P. H. (1983). Bank runs, deposit insurance, and liquidity. *Journal of Political Economy*, 91(3), 401–419.

DiMaggio, P. J., & Powell, W. W. (1983). The iron cage revisited: Institutional isomorphism and collective rationality in

organizational fields. *American Sociological Review*, 48(2), 147–160.

Duchek, S. (2020). Organizational resilience: A capability-based conceptualization. *Business Research*, 13, 215–246. <https://doi.org/10.1007/s40685-019-0085-7>

Eisenhardt, K. M., & Martin, J. A. (2000). Dynamic capabilities: What are they? *Strategic Management Journal*, 21(10–11), 1105–1121. [https://doi.org/10.1002/1097-0266\(200010/11\)21:10/11%3C1105::AID-SMJ133%3E3.0.CO;2-E](https://doi.org/10.1002/1097-0266(200010/11)21:10/11%3C1105::AID-SMJ133%3E3.0.CO;2-E)

Fernandes, D., Lynch, J. G., Jr., & Netemeyer, R. G. (2014). Financial literacy, financial education, and downstream financial behaviors. *Management Science*, 60(8), 1861–1883. <https://doi.org/10.1287/mnsc.2013.1849>

Fornell, C., & Larcker, D. F. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of Marketing Research*, 18(1), 39–50.

<https://doi.org/10.1177/002224378101800104>

Gomber, P., Koch, J.-A., & Siering, M. (2017). Digital finance and FinTech: Current research and future research directions.

Journal of Business Economics, 87(5), 537–580. <https://doi.org/10.1007/s11573-017-0852-x>

Hair, J. F., Risher, J. J., Sarstedt, M., & Ringle, C. M. (2019). When to use and how to report the results of PLS-SEM. *European Business Review*, 31(1), 2–24. <https://doi.org/10.1108/EBR-11-2018-0203>

Henseler, J., & Chin, W. W. (2010). A comparison of approaches for the analysis of interaction effects between latent variables using partial least squares path modeling. *Structural Equation Modeling*, 17(1), 82–109.

<https://doi.org/10.1080/10705510903439003>

Henseler, J., Ringle, C. M., & Sarstedt, M. (2015). A new criterion for assessing discriminant validity in variance-based structural equation modeling. *Journal of the Academy of Marketing Science*, 43(1), 115–135. <https://doi.org/10.1007/s11747-014-0403-8>

Henseler, J., Ringle, C. M., & Sarstedt, M. (2016). Testing measurement invariance of composites using partial least squares. *International Marketing Review*, 33(3), 405–431. <https://doi.org/10.1108/IMR-09-2014-0304>

Huston, S. J. (2010). Measuring financial literacy. *Journal of Consumer Affairs*, 44(2), 296–316. <https://doi.org/10.1111/j.1745-6606.2010.01170.x>

Kurniasari, F., Abd Hamid, N., & Lestari, E. D. (2025). Unraveling the impact of financial literacy, financial technology adoption, and access to finance on small medium enterprises business performance and sustainability: A serial mediation model. *Cogent Business & Management*, 12(1), Article 2487837. <https://doi.org/10.1080/23311975.2025.2487837>

Levine, R. (1997). Financial development and economic growth: Views and agenda. *Journal of Economic Literature*, 35(2), 688–726.

Linnenluecke, M. K. (2017). Resilience in business and management research: A review of influential publications and a research agenda. *International Journal of Management Reviews*, 19(1), 4–30. <https://doi.org/10.1111/ijmr.12076>

Lusardi, A., & Mitchell, O. S. (2014). The economic importance of financial literacy: Theory and evidence. *Journal of Economic Literature*, 52(1), 5–44. <https://doi.org/10.1257/jel.52.1.5>

Ministry of Micro, Small and Medium Enterprises. (2020). Gazette notifications No. S.O. 1702(E) and S.O. 2119(E): Revised classification of micro, small and medium enterprises, effective 1 July 2020. Government of India.

Ministry of Micro, Small and Medium Enterprises. (2025, March 23). Revision of investment and turnover criteria for classification of micro, small and medium enterprises, effective 1 April 2025 [Notification]. Government of India.

Nagy, A. S., Arie, F. V., Tuegeh, O. D. M., Bittner, B., & Tumiwa, J. R. (2025). FinTech adoption for SMEs in different socioeconomic contexts: Evidence from Hungary and Indonesia. *Financial Innovation*, 11(1), Article 131. <https://doi.org/10.1186/s40854-025-00876-8>

Ozili, P. K. (2018). Impact of digital finance on financial inclusion and stability. *Borsa Istanbul Review*, 18(4), 329–340. <https://doi.org/10.1016/j.bir.2017.12.003>

Park, S., & Gupta, S. (2012). Handling endogenous regressors by joint estimation using copulas. *Marketing Science*, 31(4), 567–586. <https://doi.org/10.1287/mksc.1120.0718>

Peteraf, M. A. (1993). The cornerstones of competitive advantage: A resource-based view. *Strategic Management Journal*, 14(3), 179–191.

<https://doi.org/10.1002/smj.4250140303>

Podsakoff, P. M., MacKenzie, S. B., Lee, J.-Y., & Podsakoff, N. P. (2003). Common method biases in behavioral research: A critical review of the literature and recommended remedies. *Journal of Applied Psychology*, 88(5), 879–903. <https://doi.org/10.1037/0021-9010.88.5.879>

Reserve Bank of India. (2025, July 22). RBI's Financial Inclusion Index shows growth across all segments in FY25 [Press release]. Press Information Bureau, Government of India. <https://www.pib.gov.in/PressNoteDetails.aspx?NoteId=154980&ModuleId=3®=3&lang=1>

Sarma, M. (2008). Index of financial inclusion (Working Paper No. 215). Indian Council for Research on International Economic Relations (ICRIER).

Sarma, M., & Pais, J. (2011). Financial inclusion and development. *Journal of International Development*, 23(5), 613–628.

Sharma, K. (2025). Evaluating UPI's role in advancing financial inclusion and MSMEs'

development in India. International Journal of Economics, Finance and Management Sciences, 13(5), 336–344.

<https://doi.org/10.11648/j.ijefm.20251305.19>

<https://doi.org/10.1016/j.jbusres.2019.09.022>

Shmueli, G., Ray, S., Velasquez Estrada, J. M., & Chatla, S. B. (2016). The elephant in the room: Predictive performance of PLS models. Journal of Business Research, 69(10), 4552–4564.

<https://doi.org/10.1016/j.jbusres.2016.03.049>

Shmueli, G., Sarstedt, M., Hair, J. F., Cheah, J.-H., Ting, H., Vaithilingam, S., & Ringle, C. M. (2019). Predictive model assessment in PLS-SEM: Guidelines for using PLSpredict. European Journal of Marketing, 53(11), 2322–2347.

Teece, D. J. (2007). Explicating dynamic capabilities: The nature and microfoundations of (sustainable) enterprise performance. Strategic Management Journal, 28(13), 1319–1350.

<https://doi.org/10.1002/smj.640>

Verhoef, P. C., Broekhuizen, T., Bart, Y., Bhattacharya, A., Dong, J. Q., Fabian, N., & Haenlein, M. (2021). Digital transformation: A multidisciplinary reflection and research agenda. Journal of Business Research, 122, 889–901.