

Tech–Gender Empowerment in Women-Managed MSMEs: How Digital Financial Capability and Transformational Leadership Build Competitiveness

Aryani Sairun^{1*}, Selvi Aristantya², Chairul Imam³, Irna Triannur Lubis⁴

^{1,2,4}Universitas Battuta, Medan, Indonesia

³Universitas Pembinaan Masyarakat Indonesia, Medan, Indonesia

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ABSTRACT

This study examines how digital financial capability and women's transformational leadership shape the competitiveness of women-managed micro, small, and medium enterprises (MSMEs) and develops the Tech–Gender Empowerment framework to explain how these capabilities complement each other in a digitalising business environment. Using a sequential explanatory mixed-method design, the quantitative stage employed Partial Least Squares Structural Equation Modelling (PLS-SEM) to assess the relationships among digital financial capability, women's transformational leadership, and MSME competitiveness, while the qualitative stage used NVivo-assisted thematic coding to explain how financial technology use, leadership practices, and business adaptation interact in everyday MSME management. The study targeted women-managed MSMEs in Medan, Indonesia. Results show that digital financial capability significantly affects MSME competitiveness ($\beta = 0.448$, $t = 6.893$, $p < 0.001$), as does women's transformational leadership ($\beta = 0.273$, $t = 4.003$, $p < 0.001$). Together, these predictors explain 41.3% of the variance in competitiveness. Qualitative findings indicate that digital financial capability involves understanding digital financial services, managing transactions, controlling digital risks, and using financial information for decision-making, while transformational leadership supports vision, intellectual stimulation, individualised support, and digital innovation. The study contributes by conceptualising digital financial capability as an organisational capability and women's transformational leadership as a change-oriented capability, integrated through the Tech–Gender Empowerment framework. Despite limitations related to its cross-sectional design and focus on Medan, the findings suggest that women-focused MSME programmes should integrate digital financial literacy, risk management, evidence-based decision-making, and leadership development to strengthen sustainable digital adoption and competitiveness.

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Introduction

Digital transformation is no longer a peripheral concern for small businesses. Payment systems, mobile banking, marketplaces, social media, cloud applications, and digitally generated transaction records increasingly shape how firms reach customers, organise work, and make decisions. Yet a persistent finding in the SME literature is that access to technology and the capacity to create value from technology are not the same thing. Digitalisation can improve performance, but its benefits depend on the resources, skills, routines, and managerial choices through which digital tools are embedded in the business (Eller et al., 2020; Matarazzo et al., 2021; Verhoef et al., 2021). This distinction is especially consequential for micro, small, and medium enterprises (MSMEs), where scarce resources leave little room for technology that is adopted but not meaningfully used.

The capability problem is visible in everyday financial management. For many MSMEs, digitalisation first appears in practical forms: a QR payment, a bank transfer, an e wallet, a marketplace transaction, or a mobile banking notification. Those tools can reduce friction and make transactions more traceable, but they do not automatically improve cash flow control, investment choices, cost management, or business planning. Recent research has therefore begun to connect financial knowledge with access to and use of digital finance. Frimpong et al. (2022), for example, show that access to digital finance is closely intertwined with financial literacy and SME performance, while Graña Alvarez et al. (2024) demonstrate that financial literacy influences financial behaviour, organisational capability, and SME outcomes. Evidence from Indonesia likewise suggests that business automation and financial literacy matter for sustainable MSME performance (Nugraheni et al., 2025).

This study develops that line of reasoning through the construct of digital financial capability (DFC). DFC is treated here not as simple digital finance adoption, and not as financial literacy under a new label, but as the

practical capability to understand digital financial services, manage digital transactions, control technology related financial risks, and turn financial information into business decisions. The distinction matters because the competitive value of digital finance emerges when entrepreneurs can interpret what digital systems reveal about their business and act on that information. Research on digital payments and mobile money already indicates that these technologies can support SME performance, particularly when firms possess complementary dynamic capabilities (Ledi et al., 2023). The present study asks what happens when those financial technologies are approached as an integrated capability rather than as isolated tools.

A second issue concerns leadership. Digital transformation is frequently described as a technological process, but the actual work of transformation is organisational. People must learn new routines, trust unfamiliar systems, alter how they communicate, and decide which legacy practices should be retained or abandoned. Leadership consequently becomes part of the mechanism through which digital technologies are converted into business outcomes. Studies of SME digitalisation increasingly point to the importance of managerial readiness, professional leadership, learning, and resource reconfiguration (Malodia et al., 2023; Saeedikiya et al., 2024; Warner & Wäger, 2019). Transformational leadership is particularly relevant because it centres on vision, intellectual stimulation, individualised consideration, and the mobilisation of followers around change (Bass & Riggio, 2006).

The leadership issue acquires additional significance in women managed MSMEs. The female entrepreneurship literature has documented both the expanding role of women in enterprise development and the distinctive structural constraints they may face in emerging markets (Corrêa et al., 2022; Suseno, 2021). At the same time, evidence from Indonesia shows that digital transformation, innovation, technology readiness, and competitive advantage are increasingly central to the performance of women-led MSMEs (Kadiyono & Sulistiobudi,

2024; Susanti et al., 2023). What remains less well explained is the organisational mechanism through which women owner managers lead digital change while simultaneously developing the financial capability required to use digital tools strategically.

This gap is not simply a matter of adding gender to an existing digitalisation model. Leadership research has long shown that women and men may, on average, display somewhat different patterns of transformational and transactional leadership, although the differences are not deterministic and should not be essentialised (Eagly et al., 2003). The relevant question for the present study is therefore not whether women are inherently more transformational leaders. Rather, it is whether transformational leadership practices exercised by women owner managers help small firms make better use of digital financial resources and, in turn, compete more effectively. This framing keeps the analysis focused on observable organisational behaviour while acknowledging the gendered context in which entrepreneurship takes place.

The study is situated in Medan, one of Indonesia's major urban economies, where women managed MSMEs operate within a market that is simultaneously recovering, digitalising, and becoming more competitive. The research proposal underpinning this study identified a practical mismatch between the growth of digital infrastructure and the uneven ability of MSMEs to turn digital tools into sustained competitive advantage. That mismatch motivates an integrated model in which technology capability and leadership capability are examined together rather than as separate policy or research domains.

Against this background, the study introduces the Tech–Gender Empowerment framework. The framework conceptualises DFC as a technology financial capability and women's transformational leadership (WTL) as an organisational change capability. Both are expected to contribute directly to MSME competitiveness, understood as a multidimensional outcome reflected in business

growth, cost efficiency, innovation, and market expansion. The framework is anchored in the resource based view and dynamic capabilities perspective, which emphasise that firms create advantage not merely by possessing resources but by developing capabilities to deploy, combine, and reconfigure them as conditions change (Barney, 1991; Eisenhardt & Martin, 2000; Teece, 2007).

The study addresses three questions. First, to what extent does digital financial capability improve the competitiveness of women managed MSMEs? Second, to what extent does women's transformational leadership contribute to competitiveness? Third, through what practical mechanisms do these capabilities become visible in the day to day management of women led firms? A sequential explanatory mixed method design is used to answer these questions. PLS SEM establishes the strength of the structural relationships, while qualitative coding is used to interpret how financial technology, leadership, and competitive adaptation are experienced in practice.

The paper contributes in three ways. It sharpens the digital capability literature by isolating the financial decision domain; it extends work on women's entrepreneurship by examining women as organisational change agents rather than only as beneficiaries of empowerment; and it combines statistical and qualitative evidence to develop the Tech Gender Empowerment mechanism. In doing so, the study responds to calls for SME digital-transformation research that pays greater attention to microfoundations, managerial agency, and the capabilities through which technology becomes business value (Scuotto et al., 2021; Saeedikiya et al., 2024).

2. Methodology

2.1 Research design

The study used a sequential explanatory mixed method design, in which quantitative analysis was followed by qualitative interpretation. This design is appropriate when the first phase establishes patterns among variables and the second phase is used to understand how those patterns arise in

practice (Creswell & Plano Clark, 2018). The quantitative stage tested the proposed structural model using PLS SEM. The qualitative stage used NVivo-assisted thematic analysis to explain how the three focal constructs were experienced by women MSME managers.

The use of PLS SEM was appropriate for two reasons. First, the study focuses on prediction and explanation of variance in MSME competitiveness. Second, the model comprises latent constructs measured with multiple indicators. PLS SEM allows measurement quality and structural relationships to be evaluated in a coherent two-stage process (Hair et al., 2017; Sarstedt & Cheah, 2019).

2.2 Research setting, population, and sampling

The quantitative population consisted of MSMEs managed by women in Medan, Indonesia. Purposive sampling was used because the research questions require respondents with direct experience of both business management and digital financial services. Eligible businesses were required to (1) be owned or managed by a woman, (2) operate in Medan, (3) have used or been exposed to services such as QRIS, mobile banking, e wallets, or marketplaces, and (4) have operated for at least two years.

The research protocol set a target of 200 MSME respondents. A supplementary power calculation prepared for the manuscript indicates that a model with two predictors, a medium effect size ($f^2 = 0.15$), $\alpha = 0.05$, and statistical power of 0.95 requires approximately 107 observations; the protocol target therefore provides an adequate

margin above this benchmark (Cohen, 1988). The exact number of usable cases in the cleaned SmartPLS dataset should be reported in the final submission once confirmed from the source data file.

For the qualitative stage, the research protocol specified four purposively selected informants drawn from women MSME owner managers and relevant MSME stakeholders. Semi structured interviews were intended to clarify experiences of digital financial management, leadership, adaptation, and competitiveness.

2.3 Construct operationalisation and measures

All constructs were operationalised on a five point Likert scale. DFC was defined as the ability to understand, manage, and make effective financial decisions through digital technology. WTL captured the owner manager's ability to articulate direction, stimulate new thinking, respond to individual needs, and encourage digital innovation. MSME competitiveness represented the firm's capacity to maintain and improve its position through growth, efficiency, innovation, and market expansion.

The empirical measurement model contained eight indicators for each construct (DFC1–DFC8, WTL1–WTL8, and COM1–COM8). Because the source material provided construct dimensions and indicator codes but not the final verbatim questionnaire items, the manuscript reports the validated measurement structure without inventing item wording. The final submission should append or archive the exact questionnaire used in the field.

Table 1. Operationalisation of The Study Constructs

Construct	Operational definition	Core dimensions	Scale
Digital Financial Capability (DFC)	Ability to understand, manage, and make financial decisions using digital technology.	Understanding digital financial services; transaction management; digital risk control; financial decision-making	Likert 1–5

Women's Transformational Leadership (WTL)	Ability of women owner managers to inspire, direct, and support organisational adaptation to technology-based change.	Vision and inspiration; intellectual stimulation; individualised consideration; encouragement of digital innovation	Likert 1–5
MSME Competitiveness (COM)	Ability of the MSME to maintain and strengthen its market position.	Business growth; cost efficiency; product/service innovation; market expansion	Likert 1–5

2.4 Quantitative analysis

The quantitative analysis followed the standard PLS SEM sequence. Indicator reliability was assessed through outer loadings. Internal consistency reliability was examined using Cronbach's alpha, rho_A, and composite reliability (rho_C). Convergent validity was assessed using average variance extracted (AVE), and discriminant validity was examined with the heterotrait–monotrait ratio (HTMT), which is more sensitive to discriminant-validity problems than traditional cross loading approaches (Henseler et al., 2015). Variance inflation factors (VIFs) were inspected for collinearity.

The structural model was evaluated using standardised path coefficients, bootstrapped standard errors, t-values, p-values, coefficients of determination (R^2 and adjusted R^2), and effect sizes (f^2). Statistical significance was interpreted together with effect magnitude because p values alone do not indicate substantive importance. Following conventional guidance, f^2 values near 0.02, 0.15, and 0.35 can be read as small, medium, and large effects, respectively, while recognising that practical relevance depends on research context (Cohen, 1988; Hair et al., 2017).

4.5 Qualitative analysis and integration

The qualitative material was organised in NVivo around the three focal constructs and their subthemes. For DFC, the coding structure comprised understanding digital financial services, digital transaction management, digital risk control, and financial decision making. WTL

was coded through vision and inspiration, intellectual stimulation, individualised consideration, and encouragement of digital innovation. Competitiveness was coded through growth, efficiency, innovation, and market expansion.

The purpose of the qualitative stage was explanatory rather than simply confirmatory. Accordingly, the analysis focused on how digital transactions become useful information, how leaders encourage technology-related learning, and how these processes are linked to the competitive outcomes experienced by MSMEs. A joint-display logic was then used to connect each statistically supported PLS SEM relationship with the qualitative mechanism that best explained it.

3. Results

3.1 Measurement model analysis

3.1.1 Indicator reliability and convergent validity

The outer loadings show a generally coherent measurement model. Competitiveness indicators ranged from 0.739 to 0.810, DFC indicators from 0.601 to 0.823, and WTL indicators from 0.735 to 0.829. Most indicators exceeded 0.70. DFC8 produced the lowest loading (0.601); it was retained because it remained above 0.60 and the construct as a whole showed satisfactory reliability and AVE, preserving the breadth of the DFC domain rather than narrowing the construct solely for statistical convenience.

Table 2. Outer loadings

Construct	Item	Outer loading
Competitiveness of MSMEs	COM1	0.739
	COM2	0.779
	COM3	0.810
	COM4	0.783
	COM5	0.801
	COM6	0.781
	COM7	0.741
	COM8	0.750
Digital Financial Capability	DFC1	0.804
	DFC2	0.823
	DFC3	0.793
	DFC4	0.775
	DFC5	0.713
	DFC6	0.743
	DFC7	0.769
	DFC8	0.601
Women's Transformational Leadership	WTL1	0.829
	WTL2	0.792
	WTL3	0.735
	WTL4	0.758
	WTL5	0.784
	WTL6	0.811
	WTL7	0.801
	WTL8	0.797

Internal consistency reliability was strong across the three constructs. Cronbach's alpha ranged from 0.892 to 0.913, rho_A from 0.897 to 0.919, and composite reliability from 0.914 to 0.930. AVE values ranged from 0.571 to 0.623, exceeding the 0.50 benchmark for convergent validity. These results indicate that the indicators share sufficient variance to represent their intended constructs.

Table 3. Reliability and Convergent Validity

Construct	Cronbach's α	rho_A	Composite reliability	AVE
MSME Competitiveness	0.904	0.906	0.922	0.598
Digital Financial Capability	0.892	0.897	0.914	0.571

Women's Transformational Leadership	0.913	0.919	0.930	0.623
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3.1.2 Discriminant validity and collinearity

HTMT values were 0.655 between DFC and competitiveness, 0.567 between WTL and competitiveness, and 0.619 between DFC and WTL. All values are comfortably below the commonly used 0.85 threshold, supporting discriminant validity (Henseler et al., 2015). Indicator VIF values ranged from 1.338 to 3.029, suggesting that severe collinearity was not evident in the supplied measurement output.

Table 4. HTMT Discriminant Validity Assessment

Construct	MSME Competitiveness	DFC	WTL
MSME Competitiveness	—		
Digital Financial Capability	0.655	—	
Women's Transformational Leadership	0.567	0.619	—

3.2 Structural model analysis

The structural model explains 41.3% of the variance in MSME competitiveness ($R^2 = 0.413$; adjusted $R^2 = 0.405$). In an MSME setting, where performance and competitiveness are shaped by many market, financial, institutional, and managerial influences, this level of explained variance indicates meaningful explanatory power without implying that the model captures the full complexity of competitiveness.

Both hypothesised paths were positive and statistically significant. DFC had the stronger direct relationship with competitiveness ($\beta = 0.448$, $t = 6.893$, $p < 0.001$), supporting H1. WTL also had a significant positive relationship with competitiveness ($\beta = 0.273$, $t = 4.003$, $p < 0.001$), supporting H2. The effect-size estimates reinforce this difference: DFC produced $f^2 = 0.233$, a moderate effect, whereas WTL produced $f^2 = 0.087$, a smaller but still meaningful contribution.

Table 5. Structural Model Results and Hypothesis Testing

Hypothesis	Relationship	β	STDEV	t-value	p-value	f^2	Decision
H1	DFC $\rightarrow$ MSME Competitiveness	0.448	0.065	6.893	<0.001	0.233	Supported
H2	WTL $\rightarrow$ MSME Competitiveness	0.273	0.068	4.003	<0.001	0.087	Supported

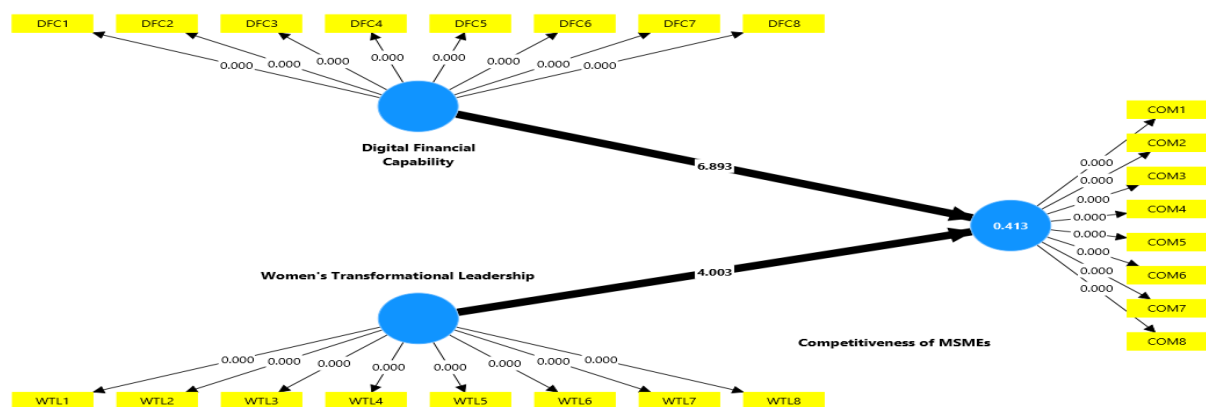


Figure 1. Structural model results

3.3 Qualitative explanatory findings

3.3.1 Digital financial capability: moving from payment access to financial control

The NVivo coding structure depicts DFC as a multidimensional capability rather than a single act of technology use. At the most basic level, respondents' digital finance experience revolves around transactions and payments—QRIS, transfers, mobile banking, e wallets, and related services. The analytical significance of these tools, however, lies in what happens after the payment is made. Digital records make financial activity more visible. Once inflows, outflows, balances, and transaction histories can be reviewed, the entrepreneur has a stronger basis for monitoring the business.

Three mechanisms are especially relevant. First, transaction management improves administrative discipline because records can be traced rather than reconstructed from memory. Second, risk control becomes part of financial capability: transaction verification, account security, and fraud awareness determine whether digital finance remains an asset rather than a new source of vulnerability. Third, information can be translated into decisions. The qualitative coding therefore supports a progression from digital payment to financial control and from financial control to decision quality.

This progression explains why DFC had the strongest path coefficient in the quantitative model. The effect is not simply about convenience. It reflects a closer connection between day to day transactions and managerial judgement. When financial information becomes more timely and visible, the owner manager is better placed to adjust expenditure, evaluate stock needs, identify cash shortages, and plan expansion.

3.3.2 Women's transformational leadership: making digital change workable

The WTL coding structure centres on four themes: vision and inspiration, intellectual stimulation, individualised consideration, and encouragement of digital innovation. Together they portray digital transformation as a social

process. A new financial or marketing technology may be technically simple, but it still asks people to change routines. Leadership determines whether that change is framed as an imposed task or as part of a shared effort to improve the business.

Vision gives the change direction. Intellectual stimulation creates room to question routines and experiment with better ways of working. Individualised consideration is particularly salient in MSMEs, where employees or family members may have very different levels of digital confidence. Encouragement of digital innovation connects leadership directly with practice by legitimising the use of marketplaces, digital payments, social media, or financial applications.

The qualitative evidence therefore helps interpret the smaller but significant WTL coefficient. Leadership does not replace financial or technological capability; it makes capability easier to develop and deploy. This is consistent with the dynamic capabilities view, in which managerial agency shapes how resources are reconfigured when the environment changes.

3.3.3 MSME competitiveness as an experienced outcome

The competitiveness coding is organised around business growth, cost efficiency, product or service innovation, and market expansion. This structure matters because women owner managers do not experience competitiveness as a single financial ratio. They experience it through whether customers can be reached more easily, whether transactions are less costly, whether products can be adjusted to changing demand, and whether the business can operate with greater control.

Digital technology can touch all four dimensions. Financial applications can improve cost visibility; marketplaces and social media can widen market access; digital communication can shorten customer response time; and better information can support product or service adaptation. Competitiveness in the Tech Gender framework is therefore the cumulative result of several

operational improvements rather than a one dimensional sales outcome.

5.4 Mixed method integration: the Tech–Gender Empowerment mechanism

The joint interpretation of both stages produces a simple but consequential mechanism. DFC explains whether the business can turn digital

financial tools into reliable information and decisions. WTL explains whether the organisation can learn, adapt, and persist with change. The two capabilities are conceptually distinct, as supported by the HTMT results, but they address complementary parts of the same transformation problem.

Table 6. Joint Display Of Quantitative and Qualitative Findings.

Quantitative relationship	Qualitative explanatory mechanism	Integrated interpretation
DFC → Competitiveness $\beta = 0.448, p < 0.001$	Transactions → traceable records → risk control → better financial decisions	Digital finance improves competitiveness when it becomes a decision capability, not merely a payment channel.
WTL → Competitiveness $\beta = 0.273, p < 0.001$	Vision → learning → support → digital innovation and adaptation	Leadership contributes by making technology-related change understandable, learnable, and sustainable.
MSME Competitiveness	Growth + efficiency + innovation + market expansion	Competitive value emerges through several operational and market outcomes, not through sales alone.

4. Discussion

The findings tell a more nuanced story than a conventional ‘technology improves performance’ argument. Both DFC and WTL matter, but they matter in different ways. The stronger DFC coefficient shows that the immediate competitive payoff in these women managed MSMEs is closely tied to the ability to control and interpret financial activity in a digital environment. Leadership contributes as well, but its effect is more organisational: it shapes whether the firm can move people, routines, and expectations in the same direction as the technology.

4.1 Why digital financial capability matters

H1 is supported, with DFC showing a positive effect on competitiveness ($\beta = 0.448$). This result is consistent with studies linking digital finance, financial literacy, and SME performance (Daud et al., 2022; Frimpong et al., 2022; Nugraheni et al., 2025). It also extends those studies by treating the relevant resource as a capability bundle rather

than separating literacy, payments, and access into unrelated variables.

The distinction between adoption and capability helps reconcile why digitalisation sometimes produces inconsistent performance effects. Susanti et al. (2023), for example, found that digital transformation did not directly improve the performance of women owned MSMEs but worked through innovation and competitive advantage. Eller et al. (2020) likewise show that digitalisation is embedded in a set of antecedent resources and organisational conditions. The present findings suggest that one missing mechanism may be the entrepreneur’s ability to translate digital financial activity into managerial control and financial decisions.

This point is reinforced by the qualitative analysis. Payment acceptance is only the entry point. Competitive value increases when transaction data are interpreted, risks are controlled, and information is used to make decisions about

costs, working capital, inventory, or expansion. That mechanism is close to the dynamic-capabilities idea of sensing and seizing: digital records make the firm's financial position more visible, while financial capability allows the entrepreneur to respond to what is sensed (Teece, 2007).

The finding also has a microfoundational implication. Scuotto et al. (2021) show that individual digital capabilities are important to SME growth in the digital transformation era. DFC identifies a specific microfoundation within that broader argument: the owner manager's financial interpretation and decision capacity. In small firms, where formal finance teams are often absent, this capability is not peripheral. It may be one of the central ways through which digitalisation enters strategy.

4.2 Why women's transformational leadership matters

H2 is also supported. WTL has a positive effect on competitiveness ($\beta = 0.273$), although the effect is smaller than that of DFC. The finding aligns with research showing that transformational leadership facilitates innovation and business performance in smaller firms (Cuevas Vargas et al., 2023) and with studies positioning leadership as a critical component of the SME digital transformation journey (Malodia et al., 2023).

The qualitative findings help explain why the effect is meaningful even when it is not the strongest predictor. Transformational leadership operates through social and cognitive pathways. It gives employees or family members a reason to accept new routines, encourages learning when the first attempt at a digital tool is imperfect, and allows the owner manager to adapt support to different levels of confidence. In other words, leadership influences the conditions under which capability is developed and used.

The gendered context adds a further layer. Female entrepreneurship research in emerging markets has often focused on barriers, access to resources, resilience, and institutional constraints (Corrêa et al., 2022). Those issues remain

important, but the present findings shift some attention from constraint to agency. Women owner-managers are not only navigating a digital environment; they are actively shaping how their organisations learn and respond to it. This interpretation is consistent with Suseno's (2021) account of women entrepreneurs using digital technologies to create opportunities within socially structured contexts and with evidence that women can influence innovation in emerging market SMEs (Madison et al., 2022).

At the same time, the concept should not be read as implying that transformational leadership is uniquely female. The study examines transformational behaviour among women managers because women managed MSMEs are the empirical context. The theoretical contribution lies in showing how these leadership practices function within a gendered entrepreneurial setting, not in assigning a leadership style to women as an essential characteristic.

4.3 The Tech–Gender Empowerment contribution

The main theoretical contribution is the integration of the two capabilities. Digital transformation research frequently concentrates on technology, infrastructure, strategy, or general digital competence. Women entrepreneurship research, by contrast, often concentrates on participation, constraints, empowerment, or access. The Tech Gender Empowerment framework connects these streams at the level of organisational capability.

DFC answers a practical question: can the entrepreneur use digital financial systems to create better financial control and decisions? WTL answers a different question: can the entrepreneur lead the learning and behavioural change required to embed new practices? The empirical results show that both questions matter. The constructs are empirically distinct, but their substantive meanings are complementary.

This complementarity fits the dynamic capabilities perspective. Digital transformation is

rarely achieved through a single resource. It requires a bundle of technological, cognitive, and managerial capabilities that allow the organisation to keep renewing itself (Warner & Wäger, 2019). The Tech–Gender framework adds a financial microfoundation and a leadership microfoundation to that bundle. It is therefore more useful to think of empowerment here as an organisational mechanism: technology becomes empowering when women entrepreneurs can control it, interpret it, and mobilise people around its productive use.

Importantly, the present SmartPLS output tests direct effects only. The integrated framework should not be misreported as a statistically confirmed moderation effect between DFC and WTL. The qualitative material suggests complementarity, but a formal interaction term ($DFC \times WTL \rightarrow \text{competitiveness}$) would be required to establish moderation. Treating this distinction carefully strengthens rather than weakens the paper because it keeps theoretical interpretation aligned with the evidence actually produced.

4.4 Theoretical implications

First, the study refines the digital capability literature. Much SME research uses broad measures of digital capability or digital transformation. DFC narrows the construct to a domain with direct managerial consequences: financial understanding, transaction management, digital risk control, and decision-making. This narrower conceptualisation increases theoretical precision and may help explain why similar levels of technology adoption produce different business outcomes.

Second, the study extends the women entrepreneurship literature by examining women as organisational capability builders. The emphasis is not solely on whether women obtain access to digital tools or finance, but on how they lead adaptation and use information inside the firm. This moves the discussion from access toward agency and from empowerment as an external intervention toward empowerment as a capability expressed in organisational practice.

Third, the sequential explanatory design contributes methodologically. PLS SEM identifies which relationships are statistically supported and their relative magnitude; qualitative analysis explains the mechanisms that make those relationships plausible. This matters in digital transformation research because the same statistical effect may arise from very different organisational processes. The joint display therefore adds explanatory depth beyond a purely cross sectional SEM model.

Fourth, the results support a dynamic capabilities interpretation of MSME competitiveness. The two predictors together explain 41.3% of the variance in competitiveness, indicating that internal capabilities are important but not exhaustive. Market turbulence, access to finance, sector, institutional support, competitive intensity, and firm age are likely to account for additional variance. The framework is therefore positioned as a focused explanation of two critical capabilities, not as a complete theory of MSME competitiveness.

4.5 Managerial and policy implications

The findings have a straightforward implication for digitalisation programmes: providing access to technology is necessary, but it is not enough. Training that stops at ‘how to use QRIS’ or ‘how to open an e-wallet’ teaches a transaction, not a capability. Women entrepreneurs should also learn how to reconcile digital transactions, interpret cash flow patterns, identify unusual activity, protect accounts, and use transaction information when making decisions.

The second implication is that leadership development should be integrated with technology training. A technically capable owner manager can still struggle to implement change if employees do not understand the reason for it or feel unable to learn. Short programmes on communication, learning by doing, feedback, delegation, and innovation can make digital adoption more durable. The goal is not to turn micro firms into large bureaucracies, but to help owner managers create simple routines through which technology becomes normal organisational practice.

Financial institutions and fintech providers can also use the findings. MSME facing applications should do more than process payments. Simple cash flow summaries, spending categories, anomaly alerts, transaction histories, and understandable business dashboards can reduce the cognitive burden on small business owners. A tool that helps the entrepreneur interpret the business may create more value than a tool that merely moves money faster.

For policymakers, the Tech Gender framework argues against treating women's empowerment, digitalisation, and financial inclusion as separate programmes. They intersect at the level of business capability. Programmes are likely to be more effective when they combine access to digital finance, financial decision skills, risk awareness, and leadership for organisational change.

4.6 Limitations and future research

Several limitations define the boundary of the findings. First, the study focuses on women managed MSMEs in Medan. Business ecosystems, financial infrastructure, social norms, and digital practices vary across Indonesian regions and across countries. Replication in different sectors and locations is therefore necessary before the framework can be generalised broadly.

Second, the quantitative design is cross sectional. Although the hypotheses are theoretically directional, cross sectional SEM cannot establish temporal causality. Longitudinal research could examine whether improvements in DFC precede later gains in competitiveness and whether leadership accelerates the development of that capability over time.

Third, the available SmartPLS output supports direct effects but does not contain a tested interaction term. Future studies should explicitly test whether WTL moderates the effect of DFC on competitiveness. Other mechanisms are also plausible. Financial decision quality, digital adaptation, innovation capability, or organisational learning could mediate the relationships identified here.

Fourth, competitiveness is measured perceptually. Perceptual measures are valuable because owner managers possess information about changes in customers, efficiency, innovation, and markets, but future research should combine them with objective indicators such as sales growth, transaction volume, cost ratios, customer growth, or market coverage.

Fifth, the qualitative evidence available for this manuscript is strongest at the level of coding structure and thematic interpretation. A journal submission would be strengthened by reporting the number of references coded to each theme and by including short, representative quotations from the original interview transcripts. Those additions would improve auditability without changing the substantive interpretation developed here.

5. Conclusion

This study set out to explain why digitalisation produces stronger competitive outcomes for some women managed MSMEs than for others. The answer is not found in technology alone. It lies in capability. Women owner managers need the financial capability to understand and control digital transactions, and they need the leadership capability to make new practices workable inside the organisation.

The quantitative results are clear. DFC has the strongest direct relationship with MSME competitiveness ($\beta = 0.448$, $p < 0.001$), while WTL also contributes positively ($\beta = 0.273$, $p < 0.001$). Together, the two constructs explain 41.3% of the variance in competitiveness. The qualitative analysis adds meaning to these coefficients. Digital finance creates value when transactions become information and information becomes a decision. Transformational leadership creates value when change becomes understandable, learnable, and connected to the future of the business.

The Tech–Gender Empowerment framework brings those processes together. It conceptualises digital financial capability as the capacity to use technology for financial judgement and women's transformational leadership as the capacity to

orchestrate adaptation. Their contribution is complementary even though the present model tests their direct effects separately. For scholars, this offers a more precise bridge between digital transformation, dynamic capabilities, and women's entrepreneurship. For practitioners and policymakers, the message is equally practical: digital empowerment is not achieved when a business simply gains access to an application. It is achieved when the entrepreneur can use that

application with control, judgement, and leadership.

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