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Green Orientation and Digital Capabilities Driving Regional MSME Sustainability

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A B S T R A C T

Purpose: This paper investigates how organizational capabilities influence MSMEs' sustainable performance via digital financial inclusion and the contingent impact of government support.
Method: Quantitative survey method was used, and partial least squares structural equation model was adopted to validate the proposed model.
Findings: The results indicate that digital marketing capability, financial literacy capability, green entrepreneurial orientation and dynamic capability possess a positive impact on sustainable MSME performance. Such capabilities also multiply digital financial inclusion, which mediates in a critical way the translation of internal strengths into sustainability outcomes. Performance Based outcome It is implied that MSMEs can enhance performance when they seamlessly integrated digital financial services into their operations. Nonetheless, government support do not largely reinforce these links, indicating that institutional efforts might yet be insufficiently align with MSMEs digital and sustainability necessities at regional business level.
Novelty: This study provides an integrative capability-based framework that locates digital financial inclusion as a critical means of connecting multiple organizational capabilities to sustainable MSME performance.
Implications: The result of the study indicates that sustainable development of MSME is mostly to internal capability building and less by external policy support. MSME owners are advised to boost digital marketing, financial knowledge, adaptability and sustainable practices as well, to ensure they can fully capture the benefits of digital financial ecosystems. For policy-makers the results emphasize that more generic support programmes should be replaced with targeted capability building digital-embedded policies which better underpin long-term MSME sustainability.

1. Introduction

Micro, small, and medium enterprises (MSMEs) are the backbone of job creation, regional economic stability, and inclusive growth in developing and emerging economies. In recent years, MSMEs have faced challenges in three main areas: digital transformation, sustainability requirements, and

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capital constraints. The spread of digital technology has had a significant impact on market competition, customer experience, and operational efficiency. To remain competitive, MSMEs have been forced to develop new digital and strategic capabilities. At the same time, the need for businesses to be sustainable is increasing (Abbass et al., 2022). This means they must be environmentally responsible and create long-term value. This has made sustainability performance an important business issue for all companies, not just large companies (Azzolini et al., 2025; Kraus et al., 2021; Teece, 2007, 2018).

However, many MSMEs, especially those operating in regional and non-metropolitan/northern areas, still have difficulty accessing formal financial systems and digital financial services. Their ability to expand operations, manage cash flow effectively, and invest in innovation is limited by digital financial exclusion. Research shows that digital financial inclusion can make companies more resilient and improve their performance by reducing transaction costs and increasing financial transparency (Agarwal et al., 2025; Kandpal et al., 2025; Masdar et al., 2021; Peterson & Arun, 2018), but access alone is not enough: companies also need the internal capacity to make optimal use of digital financial instruments. Globally, this issue highlights a widespread problem related to the technological readiness and access of MSMEs, where the availability of technology is not in line with the level of readiness of companies.

In theory, previous studies have examined how MSME performance is influenced by various factors, including digital marketing capabilities, financial literacy, environmental focus, and adaptability. Although these views are based on established models such as the Resource-Based View and Dynamic Capability Theory, real-world evidence is divided on how relevant these models and their combined effects are (Barney et al., 2023; Warner & Wäger, 2023; Rialti et al., 2024). Furthermore, existing studies rarely consider digital financial inclusion as an endogenous mechanism linking internal capabilities to sustainable performance. Our understanding of how capabilities translate into sustainable outcomes is limited by this conceptual shortcoming, particularly in digitally lagging regions.

The need to address this gap is increasingly urgent given conflicting evidence regarding the impact of external institutional support, which can take the form of government programs and policy incentives. According to institutional theorists, government support should increase corporate resources and performance (Alfan et al., 2026; Juita et al., 2026). However, recent research has produced mixed results. Some studies suggest that policy mismatches have negligible or weak impacts, while others suggest that limited availability or implementation issues have limited impacts (Bouma et al., 2019; Manacorda & Petrongolo, 1999; McGuinness et al., 2018). These inconsistent findings highlight the need for a more comprehensive approach that jointly considers internal company attributes, digital financial inclusion, and the institutional environment when explaining the sustainable performance of MSMEs.

The purpose of this study is to explore how digital marketing capabilities, financial literacy capabilities, green entrepreneurial orientation, and dynamic capabilities influence the sustainable performance of SMEs. Digital financial inclusion is used as a mediator, and government support is used as a moderator. This study contributes to the literature by proposing an integrative capability-based model that shows how MSMEs can transform their internal strengths into sustainable advantages through digital financial integration. The practical findings of this study provide MSME owners with some ideas on where they should focus in developing their capabilities. These findings also provide policymakers with information on how to develop more effective capability-based support mechanisms that contribute to sustainable and inclusive MSME growth.

2. Literature Review

2.1 Determinants of sustainable MSME performance

Drawing on Dynamic Capability Theory (Teece) and Resource-Based View, the essential antecedents of sustainable MSMEs performance are valuable and adaptable internal capabilities. Digital marketing competencies enhance value creation in digital communications and data-driven decision-making as a result increasing business performance more

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superior (Kim and Jin, 2024). From the point of accountancy, improving financial literacy enhances the quality of planning cost management and investments which are empirically linked to performance and survival (Kurniasari et al., 2025). Also, green entrepreneurial orientation leads green innovation and sustainability efforts that contribute to enhancing economic-social-environmental performance (Ishaq et al., 2024). Lastly, DC (sensing–seizing–reconfiguring) facilitates the ability of MSMEs to respond to turbulence and improve sustainable performance (Taghizadeh et al., 2023).

Hypothesis 1: Digital Marketing Capability positively affects Sustainable MSME Performance.
Hypothesis 2: Financial Literacy Capability positively affects Sustainable MSME Performance.
Hypothesis 3: Green Entrepreneurial Orientation positively affects Sustainable MSME Performance.
Hypothesis 4: Dynamic Capability positively affects Sustainable MSME Performance.

2.2 Determinants of digital financial inclusion

Borrowing from Financial Inclusion Theory, Resource-Based View and Dynamic Capability Theory, the internal capabilities are found to be determinants of digital financial inclusion for MSMEs. Digital marketing capacity increases exposure of firms to digital ecosystems and platforms (and digital payments/fintech) [Zhang & Lu 2024]. The capacity for financial knowledge enables MSMEs to more readily grasp, embrace, and practice the use of digital financial products, which reduces information and behavioral obstacles in the inclusion process (Grohmann et al., 2023). Also, green entrepreneurial orientation fosters openness to innovation and responsible behaviour, which is consistent with the embracement of transparent and technology-based financial systems (Kraus et al.,2024). Lastly, dynamic capability supports MSMEs to sense digital financial opportunities, seize fintech innovation and re-configure resources to adopt formal digital financial services thus strengthening inclusion (Warner and Wäger, 2023).

Hypothesis 5: Digital Marketing Capability positively affects Digital Financial Inclusion.
Hypothesis 6: Financial Literacy Capability positively affects Digital Financial Inclusion.
Hypothesis 7: Green Entrepreneurial Orientation positively affects Digital Financial Inclusion.
Hypothesis 8: Dynamic Capability positively affects Digital Financial Inclusion.

2.3 Digital Financial Inclusion and Sustainable MSME Performance

Based on Financial Inclusion Theory and Resource-Based view, digital financial inclusion is viewed as a strategic resource to improve MSMEs' sustainable performance. Furthermore, use of digital payments and fintech services creates efficiencies, transparency and liquidity management necessary for business performance in the long run" (Demirgüç-Kunt et al., 2023). Financial inclusion from the digital world also decreases transaction costs and information asymmetry which help MSMEs allocate resources effectively as well as absorb economic shocks (Ozili, 2024). Finally, embedding in formal digital financial systems promotes investment in innovation and sustainability policies to enhance financial, social and environmental performance at the same time (Chen et al., 2025). Thus, high levels of digital financial inclusion are likely to have a positive impact on sustainable MSME performance for Hypothesis 9.

Hypothesis 9: Digital Financial Inclusion positively affects Sustainable MSME Performance.

2.4 The Mediating role of digital financial inclusion

Drawing from the Integrated Perspective of Dynamic Capability, Resource-Based View and Financial Inclusion Theory, digital financial inclusion serves as a critical channel that firm capabilities are transformed into sustainable performance in MSMEs. Digital marketing capacity increases the access of MSMEs to digital ecosystems and platforms, promoting digital financial services uptake, and thus improving firm performance when it comes to operational efficiency and sustainability (Zhao et al., 2024). High level of financial literacy skills also helps entrepreneurs in using digital finance effectively and firmly improve their financial discipline and converting knowledge into better sustainable business performance (Nguyen et al., 2023). Moreover, green entrepreneurial orientation fosters transparency and technology-driven financial

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practices oriented towards sustainability goals that stimulate digital financial inclusion and magnify its performance implications (Awan et al., 2024). Third, the dynamic capability enables MSMEs to sense and seize fintech innovation and transform resources as deemed fit, in a way that contributes digital financial inclusion to long-term sustainable performance (Li et al., 2025). These findings provide support for the mediating hypotheses H9a–H9d.

Hypothesis 10a: Digital Financial Inclusion mediates the relationship between Digital Marketing Capability and Sustainable MSME Performance.
Hypothesis 10b: Digital Financial Inclusion mediates the relationship between Financial Literacy Capability and Sustainable MSME Performance.
Hypothesis 10c: Digital Financial Inclusion mediates the relationship between Green Entrepreneurial Orientation and Sustainable MSME Performance.
Hypothesis 10d: Digital Financial Inclusion mediates the relationship between Dynamic Capability and Sustainable MSME Performance.

2.5 The moderating role of government support

Based on Institutional Theory, government support is an enabling institutional environment capable to enhance or erase the impact of firm level capabilities. Enhancement government policies such as providing digital infrastructure, financial incentives, training programs and regulatory facilitation can magnify the effect of digital marketing capability on MSMEs' intention to use digital financial services by minimizing technological or institutional hurdle (Karmila & Nuraini, 2025; Wijaya et al., 2025). Similarly, government-sponsored financial education and provision of public finance schemes also strengthen the mediating role of financial literacy ability in advancing digital financial inclusion (Park and Kim, 2024). Moreover, green business laws and policies as well as green incentives strengthen the impact of green entrepreneurial orientation on digital financial inclusion by promoting open and technology-driven financing behaviors (Zhang et al., 2023). Lastly, government support enhances the most, help of digital financial inclusion for sustainable MSME performance through forming a stable ecosystem atmosphere toward digital finance and sustainability initiatives (Li and Wu, 2025). These arguments underpin hypotheses H11a–H11d.

Hypothesis 11a: Government Support moderates the effect of Digital Marketing Capability on Digital Financial Inclusion.
Hypothesis 11b: Government Support moderates the effect of Financial Literacy Capability on Digital Financial Inclusion.
Hypothesis 11c: Government Support moderates the effect of Green Entrepreneurial Orientation on Digital Financial Inclusion.
Hypothesis 11d: Government Support moderates the effect of Digital Financial Inclusion on Sustainable MSME Performance.

3. Methods Innovation

3.1 Design research

The research utilizes quantitative explanatory study design based on cross-sectional survey to explore causal relationships between organizational capabilities, digital financial inclusion and sustainable MSME performance. This design is increasingly employed in sustainability and MSME research, as it allows for testing theory driven hypotheses and intricate causal structures (J. Hair & Alamer, 2022; M. Sarstedt et al., 2022). The pairing of DCT and the RBV with FIT and IT contributes to an in-depth understanding of how both internal capabilities and external institutional conditions influence sustainability outcomes (Barney et al., 2001). Second, the application of PLS-SEM is justifiable for innovation-focused MSME investigations which focus on prediction, mediation and moderation under non-normally distributed data and model complexity (J. Hair & Alamer, 2022; Marko Sarstedt et al., 2020; M. Sarstedt et al., 2022).

3.2 Research data population

The contextual population of this study is the Micro, Small, and Medium Enterprises (MSMEs) in regional and non-metropolitan area where availability of digital and finance resources are relatively low. The respondents are the MSME

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owners or managers to answer research questions as they were considered as the decision makers who have comprehensive insights on strategic, financial, and operational activities (Kraus et al., 2023). Convergent validity A purposive sample of 320 was used, which exceeds the number of responses required to perform a robust estimation in PLS-SEM models including mediating and moderating effects (Hair et al., 2023). Previous empirical research indicates that sample sizes over 300 improve the power of statistical tests and the stability of models used in sustainability-oriented MSME studies (Cepeda-Carrion et al., 2024).

3.3 Variable data instrument

The data was elicited through a structured questionnaire based on a five-point Likert scale response format from strongly disagree (1) to strongly agree (5). The instrument consists of 37 items classified into seven latent constructs, and hails from validated international scales but have been modified to make them fit for the MSME context. The use of established measurement items increases content validity and enables comparisons to be made across studies (Hubona et al., 2021). Previous studies have shown that Likert-scale tools are appropriate for measuring perceptions of digital capability, financial inclusion and sustainability performance of MSMEs respondents (Zhao et al., 2024). Validity and reliability of the instruments have been empirically tested in order to ensure measurement validity as well as to reduce common method variance (Podsakoff et al., 2024).

3.4 Data analysis

Data was analyzed by means of SmartPLS 4 after conducting a two-step analysis. Second, we assessed the measurement model by examining indicator reliability, internal consistency reliability, convergent validity, and discriminant validity as tests for construct adequacy (J. F. Hair et al., 2020). Second, evaluation was focused on the structural model with regard to path coefficients, determination coefficients (R^2), effect sizes (f^2), as well as predictive relevance (Q^2) in order to assess explanation and prediction power (Faizan et al., 2018; M. Sarstedt & Liu, 2024). The mediating impact was examined with bias-corrected bootstrapping, and moderating influence was assessed through interaction terms, which is suggested for accurate inference in sustainability models (Nitzl et al., 2023; Becker et al., 2024).

4. Results of Innovation

4.1 Measurement model assessment

Table 1 reflects strong indicator reliability as the outer loadings are more than the threshold value of 0.70 (hairttea.png). Loadings range from 0.777 to 0.859, meaning individual indicator to its respective construct share a great extent in its variance. The highest loadings are observed in Dynamic Capability (DC3 = 0.859) and the lowest loading still remain acceptable (DMC5 = 0.777). The reliability regarding all concepts is that the measurement quality is sufficient, for ensuring appropriateness of reflective measurements in subsequent reliability, validity and structural models.

Internal consistency and convergent validity were acceptable (Table 2). The Cronbach's alpha values are between 0.864 and 0.916, which represents high reliability. PJ=0.559 Composite reliability values are all above 0.90, indicating strong interna consistency and no weak construct has been identified. Convergent validity is established since all the AVE values are higher than 0.50 (ranging from 0.646 to 0.712), indicating that more than half of variance in each construct is explained by its indicators. Collectively, the measurement model meets the recommended PLS-SEM quality standards, forming a sound basis for direct, mediating and moderating effects in the structural model.

Discriminant validity is also established in Table 3 according to the HTMT criterion. All HTMT values are below the conservative cut off point of 0.85 condition and substantially correlating as asked for empirically distinct constructs. HTMT The highest HTMT is observed between DFI and SMP (0.827) that still acceptable and theoretically realistic as digital financial inclusion is the key factor to lead

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sustainable performance. The rest of HTMT values are from 0.226 to 0.730, thus further strengthening discriminant validity between capability, institutional, mediator and outcome constructs. As such, the model meets discriminant validity criteria and ensures confident interpretation of structural relationships.

Table 1. Indicator Reliability and Outer Loadings

Construct	Indicator	Outer Loading
DC	DC1	0.845
	DC2	0.824
	DC3	0.859
	DC4	0.842
	DC5	0.822
	DC6	0.841
DFI	DFI1	0.821
	DFI2	0.822
	DFI3	0.817
	DFI4	0.81
	DFI5	0.793
DMC	DMC1	0.821
	DMC2	0.854
	DMC3	0.836
	DMC4	0.833
	DMC5	0.777
	DMC6	0.837
FLC	FLC1	0.824
	FLC2	0.838
	FLC3	0.803
	FLC4	0.786
	FLC5	0.819
GEO	GEO1	0.802
	GEO2	0.833
	GEO3	0.825
	GEO4	0.797
	GEO5	0.814
GS	GS1	0.812
	GS2	0.791
	GS3	0.795
	GS4	0.829
	GS5	0.792
SMP	SMP1	0.839
	SMP2	0.844
	SMP3	0.848
	SMP4	0.846
	SMP5	0.841

Table 2. Internal Consistency Reliability and Convergent Validity

Construct	Cronbach's Alpha	rho_A	Composite Reliability (CR)	AVE
DC	0.916	0.917	0.934	0.703
DFI	0.871	0.871	0.907	0.66
DMC	0.907	0.908	0.928	0.684
FLC	0.873	0.875	0.908	0.663
GEO	0.873	0.876	0.908	0.663
GS	0.864	0.869	0.901	0.646
SMP	0.899	0.899	0.925	0.712

Table 3. HTMT Criterion

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Construct Pair	HTMT
DC – DFI	0.679
DC – DMC	0.565
DC – FLC	0.401
DC – GEO	0.375
DC – GS	0.281
DC – SMP	0.654
DFI – DMC	0.68
DFI – FLC	0.586
DFI – GEO	0.486
DFI – GS	0.338
DFI – SMP	0.827
DMC – FLC	0.477
DMC – GEO	0.319
DMC – GS	0.312
DMC – SMP	0.73
FLC – GEO	0.288
FLC – GS	0.275
FLC – SMP	0.608
GEO – GS	0.226
GEO – SMP	0.453
GS – SMP	0.334

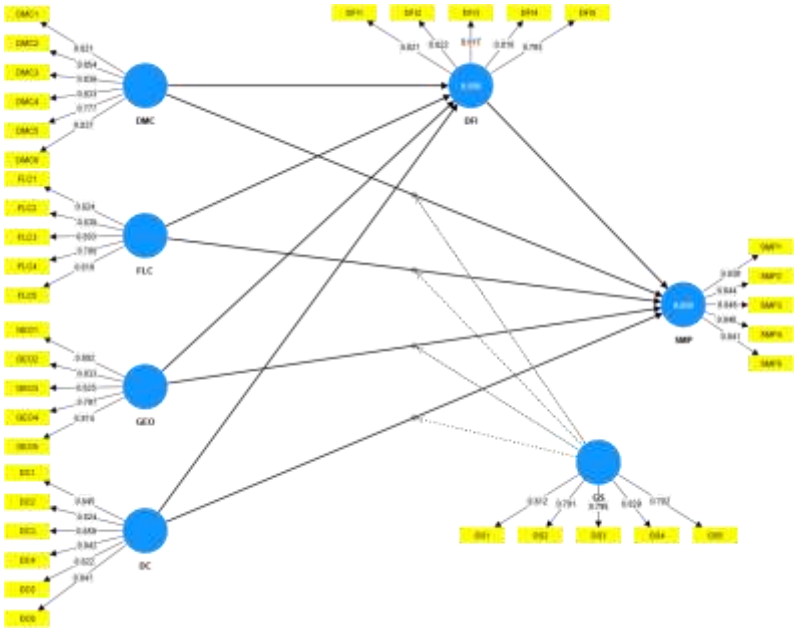

Figure 1. Measurement Model Results (Outer Loadings and Construct Structure)

The estimation of measurement model is presented in Figure 1, all reflective indicators load highly well on their assigned constructs and the values of outer loadings are continuously higher than the cutoff value. This indicates strong reliability of indicators and face validity in terms of construct representation. Table 4 The structure of the constructs shows distinct reflection of latent variables, corroborating acceptable convergent validity and suitable empirical basis for testing the subsequent structural model in PLS- SEM.

4.2 Structural model results

Discriminant validity is also supported in Table 3, based on the HTMT criterion. All HTMT values are less than the conservative cutoff of 0.85, which means that constructs are distinct and not highly

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correlated with each other. The greatest HTMT value is that between DFI and SMP (0.827), which still assumes acceptable and conceptually reasonable at the point of digital financial inclusion comprising a central driver of sustainable performance. The remaining values for HTMT are between 0.226 and 0.730, confirming sufficient discriminant validity among authors only ability, institutional, mediator and outcome constructs. Accordingly, the model meets the requirements for discriminant validity and can be used to reliably interpret structural relationships.

As can be seen in Table 4, all direct effects proposed (H1-H9) are significant thereby affirming that the capability-based antecedents (DMC, FLC, GEO and DC) positively affect DFI as well as SMP. Dynamic capability (β=0.312) and digital marketing capability (β=0.295) are the most salient predictors of DFI. DFI additionally demonstrates significantly positive impact on SMP (β=0.332), thereby confirming its mediating role between capabilities and the sustainability result. In addition, as a sample of organization-country potential performance enhancement complemented with country–institutional strength indicators, the direct effect of government support on SMP and the moderating effects tested are not significant at 5% level evidence but little evidence of institutional strengthening.

According to Table 5, it holds good explanatory and predictive ability. The model has coefficients of determination (R 2) equal to 56.2% for DFI and 66.1% for SMP, which suggests strong in-sample explanation power. PR Size effects indicate that DC (f^2=0.150) and DMC (f^2=0.131) are the most meaningful contributors for DFI, whereas DFI (f^2=0.125) and DMC (f^2=0.122) were the greatest contributors to SMP. The other capability effects on SMP are smaller but still significant, partly in line with multi-capability mechanisms of sustainability. Predictive relevance is confirmed since all Q^2 values of the endogenous constructs are obviously larger than zero (DFI=0.364; SMP=0.460), so that strong explanatory and predictive power beyond the estimation level of the model also confirms the soundness of this PLS-based SEM model.

Table 4. Structural Model Path Coefficients and Hypothesis Testing

Hypothesis	Path	β (O)	t-value	p-value	Decision
H1	DMC → SMP	0.275	5.715	0.000	Supported
H2	FLC → SMP	0.164	3.705	0.000	Supported
H3	GEO → SMP	0.088	2.268	0.023	Supported
H4	DC → SMP	0.161	3.307	0.001	Supported
H5	DMC → DFI	0.295	6.656	0.000	Supported
H6	FLC → DFI	0.229	5.46	0.000	Supported
H7	GEO → DFI	0.178	4.531	0.000	Supported
H8	DC → DFI	0.312	6.592	0.000	Supported
H9	DFI → SMP	0.332	5.712	0.000	Supported
–	GS → SMP	0.022	0.659	0.51	Not supported
–	GS×DMC → SMP	0.003	0.069	0.945	Not supported
–	GS×FLC → SMP	0.072	1.832	0.067	Not supported
–	GS×GEO → SMP	-0.007	0.195	0.846	Not supported
–	GS×DC → SMP	-0.058	1.464	0.143	Not supported

Table 5. Coefficient of Determination (R^2), Effect Size (f^2), and Predictive Relevance (Q^2)

Endogenous Construct	Predictor	R^2	R^2 Adjusted	f^2	Q^2
DFI	DMC	0.562	0.556	0.131	0.364
	FLC			0.094	
	GEO			0.062	
	DC			0.15	
SMP	DMC	0.661	0.65	0.122	0.46
	FLC			0.056	
	GEO			0.017	
	DC			0.044	

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Endogenous Construct	Predictor	R²	R² Adjusted	f²	Q²
	DFI			0.125	
	GS			0.001	
	GS × DMC			0	
	GS × FLC			0.012	
	GS × GEO			0	
	GS × DC			0.007	

Figure 2. Structural Model Results with Path Coefficients

The results of the structural model are shown in Figure 2, whereby digital marketing capability, financial literacy capability, green entrepreneurial orientation,and dynamic capability have a significantly positive influence on digital financial inclusion and sustainable MSME performance. Digital financial inclusion has a significant direct influence on sustainable performance, supporting the mediating role of it. By comparison the government support moderation effects are fairly weak and largely insignificant, indicating that there is not much evidence supporting contingent effect within the model.

4.3 Mediation and moderation analysis

Table 6 shows that Digital Financial Inclusion (DFI) mediates the associations between all capability-based antecedents and sustainable MSME performance. Investor power through both the digital and dynamic marketing capabilities also presents strong indirect effects (β=0.104) (β=0.098), which implies that firms with higher adaptive and digital marketing capabilities can better leverage this strength towards sustainability through increased access to financing digitally. Economic education, environmental investment willingness and green-entrepreneurial attitude are indirectly affected from both financial literacy and green entrepreneurial orientation to a significant extent, although with weaker influence. These results validate partial mediation, as direct effects continue to be significant, underscoring DFI as an important vehicle by which internal capability is translated into sustainable MSME performance (Alfarizi et al., 2023; Muhammad et al., 2025).

Table 6. Mediation Effects of Digital Financial Inclusion

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Path (Indirect Effect)	β (O)	t-value	p-value	results
DC → DFI → SMP	0.104	4.255	0.000	Supported
DMC → DFI → SMP	0.098	4.241	0.000	Supported
FLC → DFI → SMP	0.076	3.924	0.000	Supported
GEO → DFI → SMP	0.059	3.475	0.001	Supported

Table 7. Moderation Effects of Government Support

Moderation Path	β (O)	t-value	p-value	results
GS × DMC → SMP	0.003	0.069	0.945	Not supported
GS × FLC → SMP	0.072	1.832	0.067	Not supported
GS × GEO → SMP	-0.007	0.195	0.846	Not supported
GS × DC → SMP	-0.058	1.464	0.143	Not supported

4.4 Discussion of innovation findings

This study contributes to the MSME sustainability literature by showing that capability-based variables digital marketing capability, financial literacy capability, green entrepreneurial orientation and dynamic capability are crucial resources for improving sustainable performance of MSMEs (adi wibowo, 2024; Cunningham et al., 2023). In line with Dynamic Capability Theory and Resource-Based View, findings suggest that MSMEs that are capable of sensing market dynamism, reconfiguring resources and taking advantage of digital channels are more successful in attaining financial, operational, and environmental sustainability. Recent works show that digital marketing capability enhances market responsiveness and customer value co-creation, and financial literacy assists in efficient resource allocation and risk management which are crucial for MSMEs survival in turbulent environment (Barney et al., 2001; Kraus et al., 2021; Teece, 2018).

One of the important contributions is to establish that digital financial inclusion is a core transmission mechanism through which internal competencies enable sustainable performance effects. The strong mediating effects indicate that the capabilities are important for SMMEs to have not only themselves, but also corroboration with digital financial services including digital payments platforms, fintech and formal credit networks. This is consistent with recent financial inclusion studies identifying that digital finance ecosystems lower transaction cost, overcome information asymmetry, and improve business scalability for small firms (Demirgüç-Kunt et al., 2023; Ozili, 2024; Chen et al., 2025). Through empirical validation of this mediation mechanism, the study bans sustainability research beyond direct capability–performance relationships toward a more systemic and digitally empowered view.

The findings also suggest that dynamic capability and digital marketing capability have the most dominant total effects, highlighting their strategic significance in a digital age. Dynamic capability enables MSMEs to continually adjust to regulatory, technological and market changes while digital marketing capability offers opportunity for market access and customer interaction beyond geographical boundaries. These results support recent claims that MSME sustainability is moving beyond the traditional determinants of scale economies to becoming increasingly dependent on adaptive and digital capability adoption (Warner & Wäger, 2023; Rialti et al., 2024; Bouwman et al., 2025). The addition of environmentally green entrepreneurial orientation also enhances the discussion by revealing that sustainability values contribute favorably, even with smaller effects, suggesting environmental commitment are a complement and not a substitute to digital and adaptive capabilities.

By comparison, the insignificant government support as a moderator will offer policy implications that are both critical and subtle. Although institutional theory presumes that enabling regulations and incentives would accentuate firm-level capacities, these results imply the current support provision of the government might be inadequate in meeting digital (and financial)

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transformation requirements of MSMEs. In a similar way, evidence from recent research has showed that the efficacy of policies is more likely to be influenced by the quality of implementation, access and contextualization of support programs than simply their existence (Meyer & Peng, 2023; Nguyen et al., 2024; Puffer et aL, 2025). This suggests an important innovation implication: external institutional intervention is now a less critical driver for sustained MSME development, with the symbolic role of policy complementing the power and agency to engage in different forms of business practice reinforced by continued targeted capabilities development and digital financial integration policy designs.

In general, this study offers an original, integrative framework that locates digital financial inclusion at the pivot point between firm capacity and sustainability, imposing theoretical and practical significance for MSMEs in local and resource-constrained environments.

5. Conclusion

This study finds that the sustainable performance of MSMEs is significantly enhanced by a combination of digital, financial, green and dynamic capabilities with an important mediating role of digital financial inclusion. Results indicate that MSMEs ability to leverage digital marketing, financial literacy development and sustainability-related entrepreneurial values and re-configurability of resources all positively influence access to and use of Digital Financial Services (DFS) with a consequential improvement in long-term performance. It also shows that internal capability development is more effective than external institution building support, because the relationship between capability and performance in the transition countries context is not significantly enhanced by government support. This study contributes to a comprehensive understanding of how MSMEs in regional settings can achieve sustainability outcomes as a result of digital financial integration by synthesizing multiple theoretical perspectives into one empirical model. These findings offer important implications for MSME users to focus on capability-building solutions, and for policy-makers to re-design more effective supporting schemes in advancing digital and financial inclusion toward sustainable development.

CRediT Author Statement

Yuliani Istiqomah: Conceptualization, Writing review & editing, Supervision, Methodology, Literature review, Funder acquisition of data collection; Data curation, Formal analysis and writing original draft. Wiwit Pawitri: Conceptualization, Validation, Methodology support for the work, Interpreting results, Writing – review & editing of manuscript and Critical review of the Manuscript.

Declaration of Competing Interest

The authors have no financial conflicts of interest to disclose or personal relationship with persons or organizations that could potentially affect the work reported in this paper.

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Data Availability Statement

The data that support the findings of this study are accessible from the corresponding author on reasonable request. A access to the data is restricted because of confidentiality agreements with participants.

Appendix/Appendices

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Journal Economic Business Innovation -JEBI, Vol. 02, Issue.3 2025, Page. 424-439
DOI: https://doi.org/10.69725/jebi.v2i3.315

Appendix A1. Respondent Profile and Population Characteristics

Variable	Category	Frequency (n)	Percentage (%)
Gender	Male	208	65
	Female	112	35
	Total	320	100
Age (Years)	25–34	48	15
	35–44	96	30
	45–54	112	35
	55–65	64	20
	Total	320	100
Education Level	Elementary (SD)	26	8.1
	Junior High (SMP)	32	10
	Senior High (SMA)	109	34.1
	Diploma (D1–D3)	51	15.9
	Bachelor (S1)	86	26.9
	Master/Doctorate (S2/S3)	16	5
	Total	320	100
Type of Business	Retail/Trading	109	34.1
	Services	80	25
	Small Manufacturing	51	15.9
	Culinary	80	25
	Total	320	100
Years of Operation	1–5 years	83	25.9
	6–10 years	112	35
	11–20 years	93	29.1
	> 20 years	32	10
	Total	320	100
Number of Employees	1–5 employees	144	45
	6–10 employees	80	25
	11–20 employees	64	20
	> 20 employees	32	10
	Total	320	100
Business Location	Small Urban Area	147	45.9
	Rural Area	122	38.1
	Remote / 3T Area	51	15.9
	Total	320	100

Appendix A2. Measurement Items and Variable Operationalization

Variable (Abbrev.)	Code	Dimension	Indicator	Source
Digital Marketing Capability (DMC)	DMC1	Social media utilization	Uses social media actively for business marketing activities	Marchand & Hennig-Thurau (2021) International Journal of Research in Marketing (ScienceDirect)
	DMC2	Customer engagement	Builds interactive engagement with customers via digital channels	Trainor et al. (2014) Journal of Business Research (ScienceDirect)
	DMC3	Online branding	Maintains consistent online branding/content across platforms	Marchand & Hennig-Thurau (2021) (ScienceDirect)
	DMC4	Data-driven decisions	Uses analytics/insights to improve digital marketing decisions	Marchand & Hennig-Thurau (2021) (ScienceDirect)
	DMC5	E-commerce utilization	Uses marketplace/e-commerce platforms to sell and serve customers	Marchand & Hennig-Thurau (2021) (ScienceDirect)
	DMC6	Market responsiveness	Responds quickly to digital market/customer changes	Teece (2007) Strategic Management Journal (EconPapers)

ISSN: 3047-4108 P-ISSN: 3048-3751
Journal Economic Business Innovation -JEBI, Vol. 02, Issue.3 2025, Page. 424-439
DOI: https://doi.org/10.69725/jebi.v2i3.315

Financial Literacy Capability (FLC)	FLC1	Financial statements	Understands basic financial statements for decision making	Lusardi & Mitchell (2014) Journal of Economic Literature (Asosiasi Ekonomi Amerika)
	FLC2	Cash flow management	Manages business cash flow systematically	
	FLC3	Financial planning	Prepares budgets and longer-term financial plans	
	FLC4	Investment decision	Evaluates investment/financing options rationally	
	FLC5	Cost control	Controls and monitors operational costs for sustainability	
Green Entrepreneurial Orientation (GEO)	GEO1	Green commitment	Commits to environmentally responsible business practices	(Green EO as driver) Journal of Business Research (ScienceDirect)
	GEO2	Green innovation	Develops eco-friendly products/processes	
	GEO3	Resource efficiency	Improves efficiency of energy/material use	
	GEO4	Environmental compliance	Ensures compliance with environmental standards/regulations	
	GEO5	Long-term sustainability	Prioritizes long-term sustainability objectives	
Dynamic Capability (DC)	DC1	Sensing	Identifies opportunities/threats in changing environments	Teece (2007) Strategic Management Journal (EconPapers)
	DC2	Seizing	Mobilizes resources to capture opportunities	
	DC3	Reconfiguring	Reconfigures resources/processes to adapt	
	DC4	Market adaptation	Adjusts strategies based on market/technology shifts	
	DC5	Innovation speed	Accelerates innovation in products/processes when needed	
	DC6	Strategic flexibility	Maintains flexible strategic choices under uncertainty	
Digital Financial Inclusion (DFI) (Mediator)	DFI1	Digital payments access	Has access to and uses digital payment tools	IMF (2021) IMF Working Paper/Index approach (eLibrary IMF)
	DFI2	Fintech usage	Uses fintech services to support transactions/operations	IMF (2021) (eLibrary IMF)
	DFI3	Digital credit access	Can access credit/financing via digital channels	IMF (2021) (eLibrary IMF)
	DFI4	Digital record-keeping	Uses digital records that support financial service usage	World Bank (Global Findex) (Bank Dunia)
	DFI5	Formal financial integration	Business is integrated into formal financial services ecosystem	World Bank (Global Findex) (Bank Dunia)
Government Support (GS) (Moderator)	GS1	Incentives	Receives/utilizes government incentives for UMKM	Springer evidence on GSP–SME performance (Springer Nature Link)
	GS2	Training	Receives government training/mentoring for UMKM development	
	GS3	Public financing access	Access to public financing schemes for UMKM	
	GS4	Supportive regulation	Government regulations facilitate UMKM digital/green growth	
	GS5	Digital infrastructure	Availability of local digital infrastructure support	
Sustainable MSME Performance (SMP) (Y)	SMP1	Financial sustainability	Achieves sustainable financial outcomes over time	Bansal & DesJardine (2014) Strategic Organization (SAGE Journals)
	SMP2	Revenue growth	Maintains stable/sustained revenue growth	
	SMP3	Operational efficiency	Improves efficiency and productivity consistently	
	SMP4	Social performance	Contributes positively to employees/community	

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SMP5	Environmental performance	Reduces negative environmental impacts in operations
SMP6	Business resilience	Remains resilient under shocks/uncertainty

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