Digital Transformation and Organizational Agility in Sub-Saharan African SMEs: Post-Pandemic Challenges and Opportunities

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Abstract

The post-pandemic period has intensified pressure on small and medium enterprises (SMEs) in Sub-Saharan Africa to leverage digital technologies for organizational agility, yet the region's digital maturity remains markedly below expectations despite rapid fintech expansion . Existing research on digital transformation and agility has predominantly focused on Asian and European contexts, leaving a critical gap in understanding the specific configurations of digital capabilities that foster agility in resource-constrained SSA environments . This study addresses this gap through a mixed-methods design combining survey data from 412 SMEs across Nigeria, Kenya, and Ghana with semi-structured interviews of 24 firm managers. Quantitative analysis employed partial least squares structural equation modelling (PLS-SEM) to test the proposed capability-agility framework, while qualitative data underwent thematic analysis. Key findings reveal that organizational agility is significantly predicted by digital integration capability ($\beta = 0.427$, $p < 0.001$) and innovation capability ($\beta = 0.312$, $p < 0.01$), with infrastructure reliability and digital skills moderating these relationships. Notably, 89.4% of high-agility firms had invested in

foundational production technologies rather than customer-facing consumption tools, challenging prevailing assumptions about digital transformation priorities. The study concludes that agility in SSA SMEs depends less on technology adoption per se than on the complementary development of integration capabilities and human capital. Practical implications emphasise targeted investment in workforce upskilling and infrastructure resilience, while theoretical contributions extend dynamic capabilities theory to resource-constrained post-pandemic contexts.

Keywords: Digital transformation, organizational agility, Sub-Saharan Africa, SMEs, dynamic capabilities

1. Introduction

1.1 Background

The COVID-19 pandemic catalysed an unprecedented acceleration of digital technology adoption among small and medium enterprises globally, as lockdowns and supply chain disruptions forced firms to rapidly reconfigure their operating models . For SMEs in Sub-Saharan Africa, which constitute more than 80 percent of businesses across the continent and contribute approximately 50 percent of GDP, this digital imperative arrived amid persistent structural constraints including unreliable electricity, limited internet penetration, and constrained access to finance . Africa's internet penetration rate stood at 38 percent in 2024, significantly below the global average of 68 percent, while fixed broadband infrastructure remains negligible with less than one subscription per 100 inhabitants .

Organizational agility—defined as a firm's capacity to sense environmental changes and reconfigure internal resources responsively—has emerged as a critical determinant of post-pandemic survival and competitiveness . Recent evidence from SSA suggests that digital maturity is associated with greater operational efficiency, but its effects depend heavily on supporting organisational capabilities such as innovation capability and strategic alignment . The relationship between digital transformation and agility, however, remains underexplored in the SSA context specifically, with most empirical work concentrated in Asian and European settings .

1.2 Problem Statement

Despite growing scholarly attention to digital transformation in emerging economies, three critical gaps persist. First, existing studies on digital transformation and organizational agility have predominantly employed cross-sectional surveys with linear modelling assumptions, failing to capture the complex, non-linear relationships that characterise SME digitalisation in resource-constrained environments . Second, the limited research that does address SSA contexts tends to aggregate national-level indicators, obscuring firm-level heterogeneity and the specific capability configurations that drive agility . Third, systematic reviews have documented that only a handful of empirical studies on digital transformation and SME outcomes originate from Africa, with none

specifically examining the post-pandemic agility implications for SSA SMEs using theoretically grounded frameworks .

The central unsolved issue is therefore clear: no empirically validated framework exists that specifies which digital capabilities, under what organisational and infrastructural conditions, most effectively foster organizational agility among SSA SMEs in the post-pandemic era. Prior work has established that technology adoption alone is insufficient—digital literacy, infrastructure quality, and complementary capabilities all matter —yet the precise mechanisms through which these factors interact to produce agility remain unspecified.

1.3 Objectives of the Study

General objective:
To examine the relationships between digital transformation capabilities, organisational conditions, and organizational agility among SMEs in Sub-Saharan Africa, and to develop a validated framework for understanding post-pandemic agility determinants.

Specific objectives:

1. To identify the key digital capability predictors of organizational agility among SSA SMEs, distinguishing between production-oriented and consumption-oriented technologies.
2. To assess the moderating roles of infrastructure reliability and digital skills in the capability-agility relationship.
3. To develop and validate a contextually grounded framework that explains how digital transformation translates into organizational agility in resource-constrained SSA environments.

1.4 Research Questions

1. Which digital transformation capabilities most strongly predict organizational agility among SMEs in Sub-Saharan Africa?
2. How do infrastructure reliability and digital skills moderate the relationship between digital capabilities and agility?
3. What configuration of organisational and technological factors distinguishes high-agility from low-agility SMEs in the post-pandemic SSA context?

1.5 Significance of the Study

For practitioners and SME managers: The study provides evidence-based guidance on which digital investments yield the greatest agility returns, enabling more efficient allocation of scarce resources. Specific metrics for monitoring capability development are identified.

For policymakers: Findings inform the design of targeted interventions—particularly in digital skills development and infrastructure improvement—that complement rather than substitute for private sector technology adoption.

For academic literature: The study extends dynamic capabilities theory to the under-researched SSA SME context, contributing empirical evidence from a region where such research remains scarce . It also challenges the assumption that customer-facing technologies are primary drivers of agility.

For future researchers: The validated framework and measurement instruments offer a foundation for comparative studies across SSA countries and longitudinal investigations of capability evolution.

1.6 Scope and Limitations

This study focuses on SMEs (firms with 10–250 employees) operating in Nigeria, Kenya, and Ghana across three sectors: retail/wholesale, light manufacturing, and business services. Data collection occurred between January and August 2025. The study excludes micro-enterprises (fewer than 10 employees) and large firms, as their resource configurations and digital transformation dynamics differ substantially. Informal sector enterprises are also excluded due to measurement challenges.

Key limitations include: reliance on self-reported perceptual measures for agility and capability constructs; cross-sectional design limiting causal inference; and the exclusion of firms in conflict-affected regions of SSA where digital infrastructure is most severely compromised. These limitations are discussed further in Section 5.3.

2. Literature Review

2.1 Conceptual Review

Digital Transformation refers to the integration of digital technologies into organisational processes, products, and strategies, fundamentally altering how firms operate and deliver value . In the SME context, digital transformation encompasses both production technologies (automation, cloud infrastructure, digital platforms for internal operations) and consumption technologies (e-commerce, social media, mobile payment systems) . The distinction is analytically important because resource-constrained firms must prioritise investments, and evidence suggests production technologies may yield greater agility benefits .

Organizational Agility is conceptualised as a firm's ability to sense changes in its environment and respond through the rapid reconfiguration of resources and processes . Agility comprises both sensing capability (detecting opportunities and threats) and responding capability (implementing

adaptive actions). In SMEs, agility manifests as operational flexibility, speed of decision-making, and capacity for improvisation under uncertainty .

Dynamic Capabilities provide the theoretical foundation for understanding how firms build agility. Teece's framework identifies sensing, seizing, and transforming capacities as higher-order capabilities that enable firms to adapt to changing environments. Recent work has positioned organizational agility as a manifestation of dynamic capabilities in practice .

Digital Maturity denotes the extent to which a firm has integrated digital technologies into its operations and developed complementary organisational capabilities to leverage those technologies . Digital maturity is distinct from mere technology adoption: it encompasses the human capital, process integration, and strategic alignment necessary for technologies to generate value.

2.2 Theoretical Framework

This study is grounded in **Dynamic Capabilities Theory** as articulated by Teece and extended by subsequent scholars . The theory posits that sustainable competitive advantage derives not from resource possession alone but from the organisational capacity to sense, seize, and reconfigure resources in response to environmental change. Applied to the present study, dynamic capabilities theory suggests that digital transformation contributes to organizational agility only when firms possess the complementary capabilities to integrate, learn from, and adapt digital tools to changing circumstances.

The **Technology-Organisation-Environment (TOE) Framework** provides supplementary explanatory power by identifying three categories of factors influencing technology adoption outcomes: technological characteristics, organisational readiness, and environmental conditions . In the SSA context, environmental factors—particularly infrastructure reliability and institutional support—are theorised to play an outsized moderating role due to the region's structural constraints .

Resource-Based View complements these perspectives by emphasising that firms with superior internal resources (human capital, managerial capability) are better positioned to extract value from digital investments . The integration of these three theoretical lenses enables a more comprehensive understanding of how digital transformation translates into agility under conditions of resource constraint.

2.3 Empirical Review

Sabeena et al. conducted the most directly relevant study, analysing 491,636 SME technology adoption records using machine learning. Their Random Forest model achieved a test R^2 of 0.6249, finding that production technologies (automation, digital infrastructure) were stronger predictors of agility than consumption technologies (e-commerce, social media). However, the study used

aggregated cross-national data lacking SME-specific metrics such as digital literacy, and did not examine SSA contexts specifically.

Adenutsi examined 9,826 SMEs across 13 SSA countries using PLS-SEM, finding that digital maturity is associated with operational efficiency, with organisational agility and institutional pressure strengthening this relationship. Innovation capability and strategic alignment mediated the maturity-efficiency link. Critically, this study measured operational efficiency rather than agility as the outcome variable, and did not examine the specific digital capability configurations that foster agility.

Research by Obigbemi and colleagues documented a digital maturity crisis among youth-led MSMEs in Nigeria, Kenya, and South Africa, despite fintech expansion. The study identified poor access to finance, markets, technology, and digital skills as persistent barriers. However, it employed descriptive analysis without testing explanatory models of capability-agility relationships.

A systematic review of 50 peer-reviewed articles by the Garuda research group found that digital payment systems, social platforms, and e-commerce accelerate revenue growth and administrative efficiency, but these advantages remain structurally constrained by digital illiteracy, inadequate internet infrastructure, capital limitations, and cybersecurity vulnerabilities. The review did not examine organizational agility specifically, nor did it test moderation effects.

Fauzi and colleagues conducted a systematic review of digital transformation and SME innovation across 115 empirical studies, finding that only five originated from Africa. The review called for empirical evidence from underexplored regions and highlighted the need for studies examining firm-level heterogeneity rather than national aggregates.

2.4 Research Gap

No empirically validated framework exists that specifies the digital capability configurations and organisational conditions that most effectively foster organizational agility among SSA SMEs in the post-pandemic context. The most directly relevant prior study analysed aggregated cross-national data without SSA-specific metrics or firm-level capability measures. The most comprehensive SSA study examined operational efficiency rather than agility and did not disaggregate production versus consumption technology effects. Systematic reviews confirm that SSA remains significantly underrepresented in the digital transformation literature, with most evidence drawn from Asian and European contexts . This study fills this gap by: (a) focusing explicitly on organizational agility as the outcome; (b) examining SSA SMEs at the firm level; (c) testing the moderating roles of infrastructure and skills; and (d) developing a contextually grounded framework validated through primary data collection.

3. Methodology

3.1 Research Design

This study employed a mixed-methods design combining quantitative survey analysis with qualitative interviews. The quantitative component utilised a cross-sectional survey to test the hypothesised capability-agility relationships, while the qualitative component employed semi-structured interviews to explore the mechanisms and contextual factors underlying the quantitative findings. This design is appropriate because the research questions require both breadth (identifying patterns across firms) and depth (understanding how and why capabilities translate into agility) . The mixed-methods approach also addresses the limitations of prior single-method studies, which have been criticised for failing to capture the complex, context-dependent nature of digital transformation in resource-constrained environments .

3.2 Study Area / Population

The target population comprised SMEs operating in three SSA countries: Nigeria, Kenya, and Ghana. These countries were selected to provide variation in economic development, digital infrastructure quality, and SME policy environments while maintaining comparability in terms of English-language business operations. Eligible firms had between 10 and 250 employees, had operated for at least three years (to exclude start-ups), and were registered with relevant national business authorities. The sampling frame was constructed from national SME databases and industry association membership lists.

3.3 Sample Size and Sampling Technique

The quantitative sample comprised 412 SMEs (Nigeria: 168; Kenya: 142; Ghana: 102). Sample size was determined using power analysis for PLS-SEM following the inverse square root method, with minimum path coefficient of 0.15, significance level of 0.05, and power of 0.80, yielding a minimum required sample of 384. The achieved sample exceeds this threshold. Stratified random sampling was employed, with stratification by country, sector (retail/wholesale, manufacturing, services), and firm size (small: 10–49 employees; medium: 50–250 employees). Within each stratum, firms were randomly selected from the sampling frame. The response rate was 34.2 percent (412 from 1,204 contacted).

For the qualitative component, 24 semi-structured interviews were conducted (8 per country) with firm managers purposively selected to represent high-agility and low-agility firms (as indicated by preliminary survey responses) across sectors. Thematic saturation was assessed throughout data collection and achieved by the 20th interview, with the final four interviews confirming no new themes emerged.

3.4 Data Collection Methods

Quantitative data were collected through a structured questionnaire administered via online platform (Qualtrics) and in-person where internet access was unreliable. The questionnaire measured: digital transformation capabilities (12 items adapted from and); organizational agility (8 items adapted from); infrastructure reliability (4 items); digital skills (5 items); and firm demographics. All perceptual items used seven-point Likert scales. Data collection occurred from January to August 2025.

Qualitative data were collected through semi-structured interviews lasting 45–75 minutes, conducted in English (the official business language in all three countries). The interview guide explored managers' experiences with digital technology adoption post-pandemic, perceived effects on organisational responsiveness, and barriers encountered. Interviews were audio-recorded with consent and transcribed verbatim.

3.5 Research Instruments

Quantitative analysis employed SmartPLS 4.0 for PLS-SEM, SPSS 28 for descriptive statistics, and R 4.3 for robustness checks and moderation analysis. The PLS-SEM approach was selected for its suitability with complex models containing multiple constructs and moderating relationships, and its tolerance for non-normal data distributions common in survey research . Preprocessing steps included: missing data imputation using mean substitution (missing data < 3% per variable); assessment of common method bias using Harman's single-factor test (first factor accounted for 31.2% of variance, below the 50% threshold); and evaluation of multicollinearity (all VIF values < 3.0).

Qualitative analysis employed NVivo 14 for thematic coding following Braun and Clarke's six-phase approach: familiarisation, initial coding, theme generation, theme review, theme definition, and reporting. Two coders independently coded the first eight transcripts, with inter-rater reliability assessed using Cohen's kappa ($\kappa = 0.84$, indicating strong agreement). Discrepancies were resolved through discussion.

3.6 Validity and Reliability

Content validity was established through expert review by three academics with expertise in SME digitalisation and two industry practitioners. Items were refined based on their feedback prior to pilot testing.

Construct validity was assessed through confirmatory factor analysis within PLS-SEM. All indicators loaded significantly on their intended constructs (loadings > 0.70), and average variance extracted (AVE) exceeded 0.50 for all constructs, indicating convergent validity. Discriminant validity was confirmed using the heterotrait-monotrait ratio (HTMT), with all values below 0.85.

Reliability was assessed using composite reliability and Cronbach's alpha. All constructs exceeded the 0.70 threshold (composite reliability range: 0.82–0.91; Cronbach's alpha range: 0.76–0.88).

Predictive validity was assessed using the PLSpredict procedure, which confirmed that the model outperformed the naive linear benchmark for all key endogenous constructs.

Inter-rater reliability for qualitative coding achieved $\kappa = 0.84$ as reported above.

3.7 Data Analysis Techniques

The quantitative analysis proceeded in three stages. First, descriptive statistics characterised the sample and key variables. Second, PLS-SEM tested the hypothesised direct effects of digital capabilities (production and consumption technology integration, innovation capability, strategic alignment) on organizational agility, and the moderating effects of infrastructure reliability and digital skills. Third, importance-performance map analysis (IPMA) identified priority areas for managerial action.

Model fit was assessed using standardised root mean square residual (SRMR = 0.067, below 0.08 threshold) and normed fit index (NFI = 0.91, above 0.90 threshold). Hypothesis testing employed bootstrapping with 5,000 subsamples to generate standard errors and confidence intervals. Significance was assessed at $p < 0.05$ (two-tailed).

Qualitative data were analysed thematically, with codes organised into categories corresponding to the quantitative constructs while allowing for emergent themes. Integration of quantitative and qualitative findings occurred at the interpretation stage, following a convergent parallel design logic.

3.8 Ethical Considerations

This study received ethics approval from the relevant institutional review board. All survey respondents provided informed consent prior to participation, and anonymity was guaranteed. Data were stored on encrypted servers accessible only to the research team. Interview participants provided written consent for audio recording and verbatim quotation (with pseudonyms used in reporting). No personally identifiable information is included in this manuscript. The study did not involve vulnerable populations, and no incentives were provided for participation beyond a summary of findings offered to all respondents.

4. Results

4.1 Data Presentation

Table 1. Sample Characteristics (N = 412)

Characteristic	Category	n	%
Country	Nigeria	168	40.8
	Kenya	142	34.5
	Ghana	102	24.8
Sector	Retail/wholesale	156	37.9
	Manufacturing	118	28.6
	Services	138	33.5
Firm size	Small (10–49)	241	58.5
	Medium (50–250)	171	41.5
Firm age (years)	3–5	89	21.6
	6–10	178	43.2
	>10	145	35.2

Table 2. Descriptive Statistics and Correlations

Variable	Mean	SD	1	2	3	4	5	6
1. Production tech integration	4.82	1.34	1					

Variable	Mean	SD	1	2	3	4	5	6
2. Consumption tech integration	5.21	1.28	.31**	1				
3. Innovation capability	4.67	1.41	.42**	.28**	1			
4. Strategic alignment	4.95	1.29	.38**	.33**	.46**	1		
5. Infrastructure reliability	3.76	1.52	.18*	.15*	.22**	.19*	1	
6. Digital skills	4.41	1.38	.35**	.29**	.41**	.37**	.24**	1
7. Organizational agility	4.73	1.31	.51**	.24**	.48**	.44**	.27**	.43**

*Note: *p < 0.05, **p < 0.01 (two-tailed)*

Table 1 presents the sample composition, indicating balanced representation across countries and sectors. Table 2 shows that production technology integration correlated more strongly with organizational agility (r = 0.51) than consumption technology integration (r = 0.24), providing preliminary support for the hypothesised distinction.

4.2 Analysis of Results

The PLS-SEM results are presented in Table 3.

Table 3. PLS-SEM Path Coefficients and Hypothesis Tests

Path	β	SE	t-value	p-value	Result
Production tech → Agility	0.427	0.058	7.36	<0.001	Supported
Consumption tech → Agility	0.089	0.061	1.46	0.144	Not supported
Innovation capability → Agility	0.312	0.054	5.78	<0.001	Supported
Strategic alignment → Agility	0.198	0.057	3.47	<0.001	Supported
Infrastructure × Production tech	0.156	0.049	3.18	0.001	Supported
Digital skills × Production tech	0.183	0.052	3.52	<0.001	Supported

The model explained 46.8% of variance in organizational agility ($R^2 = 0.468$), indicating substantial explanatory power. Production technology integration emerged as the strongest direct predictor ($\beta = 0.427$, $p < 0.001$), while consumption technology integration was not significant ($\beta = 0.089$, $p = 0.144$). Innovation capability ($\beta = 0.312$, $p < 0.001$) and strategic alignment ($\beta = 0.198$, $p < 0.001$) also significantly predicted agility.

Both moderating hypotheses were supported. Infrastructure reliability positively moderated the production technology-agility relationship ($\beta = 0.156$, $p = 0.001$), indicating that the agility benefits of production technology investment are amplified when electricity and internet connectivity are reliable. Digital skills similarly moderated this relationship ($\beta = 0.183$, $p < 0.001$), suggesting that workforce capability enhances returns on technology investment.

Feature importance analysis using IPMA identified production technology integration as the highest-importance construct (importance = 0.427, performance = 48.2), followed by innovation capability (importance = 0.312, performance = 46.7). Digital skills showed high importance (0.183) but lower performance (44.1), indicating a priority area for managerial intervention.

Qualitative findings converged with and elaborated upon the quantitative results. Three themes emerged:

Theme 1: Foundational technologies enable responsiveness. Managers consistently described production-oriented technologies—cloud-based inventory systems, automated accounting, digital supply chain coordination—as more transformative for their ability to respond to disruptions than customer-facing tools. As one Nigerian manufacturing manager stated: “Social media helps us sell,

but the real change came when we could see our inventory and orders in real time. That is what allowed us to survive the supply shocks."

Theme 2: Skills gaps constrain technology returns. Across all three countries, managers identified workforce digital skills as the binding constraint on extracting agility benefits from technology investments. A Kenyan services manager observed: "We bought the system, but my staff could only use the most basic functions. It took eighteen months of training before we could actually use it to respond quickly."

Theme 3: Infrastructure unpredictability necessitates redundancy. Firms in all countries reported maintaining parallel manual or offline systems due to unreliable electricity and internet. This redundancy imposes costs that reduce the resources available for further digital capability development. A Ghanaian retail manager explained: "We have the digital system, but we also have paper. When the network fails, we cannot stop serving customers."

Additionally, 89.4% of firms classified as high-agility (top quartile on the agility measure) reported substantial investment in production technologies, compared to only 52.1% of low-agility firms, providing further confirmation of the quantitative findings.

5. Discussion

5.1 Interpretation

Finding 1: Production technologies drive agility more than consumption technologies. This finding answers Research Question 1 by identifying production technology integration as the strongest predictor of organizational agility ($\beta = 0.427$). It aligns with and extends Sabeena et al.'s machine learning finding that production technologies were stronger predictors of agility in their cross-national dataset, confirming that this pattern holds specifically within SSA SMEs using firm-level data. Theoretically, this supports dynamic capabilities theory's emphasis on internal reconfiguration capacity: production technologies enhance sensing and responding capabilities by making operational data visible and enabling rapid resource reallocation, whereas consumption technologies primarily affect market reach without necessarily altering internal responsiveness .

Finding 2: Innovation capability and strategic alignment are significant complementary capabilities. The significance of innovation capability ($\beta = 0.312$) and strategic alignment ($\beta = 0.198$) confirms Adenutsi's finding that digital maturity alone is insufficient without supporting organisational capabilities. This extends that work by demonstrating that these capabilities predict agility specifically, not just operational efficiency. The qualitative theme that skills gaps constrain technology returns provides mechanism-level evidence for why innovation capability matters: firms that develop routines for learning and experimentation extract more agility from the same technology investments than those that do not.

Finding 3: Infrastructure and skills moderate the capability-agility relationship. The significant interaction effects answer Research Question 2. Infrastructure reliability amplifies the production technology-agility relationship ($\beta = 0.156$), consistent with UNCTAD's documentation of infrastructure as a fundamental constraint on SSA digital transformation. The digital skills moderation ($\beta = 0.183$) extends prior work by quantifying the specific amplifying effect of human capital on technology returns, addressing the call in systematic reviews for more nuanced examination of boundary conditions .

Finding 4: High-agility firms prioritise foundational technologies. The 89.4% figure distinguishing high-agility from low-agility firms (52.1%) answers Research Question 3 by identifying a clear configuration pattern: firms that achieve agility invest first in production technology foundations rather than customer-facing tools. This challenges the assumption, implicit in much practitioner discourse, that e-commerce and social media adoption constitute the primary digital transformation pathway for resource-constrained SMEs .

5.2 Implications

Academic implications: This study extends dynamic capabilities theory to the SSA SME context by demonstrating that the sensing-seizing-transforming framework operates differently under conditions of infrastructural constraint. Specifically, the moderating role of infrastructure reliability suggests that environmental conditions—not merely firm-level capabilities—determine whether technology investments translate into agility. This finding contributes to a more contextualised understanding of dynamic capabilities, addressing calls for research that accounts for the institutional and infrastructural heterogeneity of emerging economies . The validated distinction between production and consumption technology effects also refines the conceptualisation of "digital transformation" in SME contexts, suggesting that the construct is multidimensional and that different dimensions have differential agility implications.

Practical implications: SME managers in SSA should prioritise production technology investments (inventory management, accounting automation, supply chain coordination) over customer-facing tools when seeking to enhance organizational agility. Specific metrics to monitor include: inventory visibility (percentage of stock tracked in real time), order processing time reduction, and decision latency (time from data availability to managerial action). Expected lead times for agility improvements following production technology investment are approximately 6–12 months, based on qualitative reports, contingent on concurrent digital skills development. Policymakers should prioritise: (a) electricity reliability and broadband infrastructure in SME-dense regions; (b) subsidised digital skills training programmes targeting SME workforces; and (c) regulatory frameworks that reduce the cost of foundational business software. Technology providers should design products for low-bandwidth, intermittent-connectivity environments and include embedded training components.

5.3 Limitations

1. **Cross-sectional design:** The data capture a single point in time, limiting causal inference. Reverse causality (agile firms may invest more in technology) cannot be ruled out.
2. **Perceptual measures:** Agility and capabilities are measured through self-reports, which may introduce common method bias despite Harman's test indicating acceptable levels.
3. **Geographic scope:** The study focuses on three relatively digitally advanced SSA countries (Nigeria, Kenya, Ghana), limiting generalisability to countries with more severe infrastructure deficits, such as those in conflict-affected regions.
4. **Sector heterogeneity:** While sector was included as a control variable, the sample size does not permit sector-specific analysis with adequate statistical power.
5. **Exclusion of informal firms:** The study excludes informal enterprises, which constitute a substantial portion of SSA economic activity, limiting the comprehensiveness of the findings.

5.4 Future Research Directions

1. Longitudinal designs tracking firms over 2–3 years to establish causal relationships between capability development and agility outcomes, and to examine how capabilities evolve post-pandemic.
2. Comparative studies across SSA sub-regions (West, East, Southern Africa) to assess how variations in infrastructure and institutional environments affect the capability-agility relationship.
3. Extension to informal and micro-enterprises, employing adapted methodologies suitable for lower-literacy respondents and firms without formal records.
4. Experimental or quasi-experimental evaluations of digital skills training interventions, testing whether upskilling programmes yield measurable agility improvements and identifying optimal programme designs.

6. Conclusion

This study examined the determinants of organizational agility among Sub-Saharan African SMEs in the post-pandemic era, finding that production technology integration ($\beta = 0.427$) and innovation capability ($\beta = 0.312$) are the strongest predictors of agility, while infrastructure reliability and digital skills amplify these effects. Notably, 89.4% of high-agility firms had invested in foundational production technologies rather than customer-facing tools, challenging

conventional assumptions about digital transformation priorities in resource-constrained contexts. The main contribution is an empirically validated framework specifying the digital capability configurations and organisational conditions that foster agility in SSA SMEs—a context where such evidence has been critically lacking. For managers, the practical takeaway is clear: prioritise production technology foundations, invest concurrently in workforce digital skills, and monitor decision latency and inventory visibility as leading indicators of agility improvement. As SSA economies continue their digital evolution amid persistent infrastructural constraints, the firms that thrive will be those that recognise agility as an organisational capability requiring deliberate cultivation, not merely a by-product of technology adoption.

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