Generative AI Capabilities and Strategic Agility: An Early Post-Pandemic Assessment of Service SMEs

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Date; November 13, 2026

Abstract

The post-pandemic period has witnessed accelerated diffusion of generative artificial intelligence (GenAI) among small and medium-sized enterprises (SMEs), yet the relationship between GenAI capabilities and strategic agility remains poorly understood, particularly in service sectors where intangible assets and rapid market responsiveness are critical. Existing research has examined AI adoption broadly but has not validated a predictive framework linking specific GenAI capability dimensions to agility outcomes in service SMEs. This study addresses that gap through a quantitative, cross-sectional design surveying 312 service SME managers across five OECD economies, using structural equation modeling and machine learning classification to assess the GenAI–agility relationship. The predictive model achieved 89.4% accuracy in classifying high-agility SMEs based on GenAI capability profiles, with prompt engineering proficiency and AI-integrated workflow redesign emerging as the strongest predictors. Findings indicate that GenAI contributes to strategic agility primarily through operational responsiveness and resource reconfiguration, rather than through direct strategic foresight enhancement. The study contributes a validated capability-agility framework for service SMEs and offers practitioners a diagnostic tool for prioritizing GenAI investments. Policy implications include targeted support for SME capability-building beyond mere technology access.

Keywords: Generative AI, strategic agility, service SMEs, post-pandemic, dynamic capabilities

1. Introduction

1.1 Background

The global economy's recovery from the COVID-19 pandemic has been uneven, with small and medium-sized enterprises (SMEs) facing persistent challenges in labor availability, supply chain volatility, and demand uncertainty . In this context, digital technologies have emerged as critical enablers of organizational resilience and adaptability. Among these, generative artificial intelligence—exemplified by large language models such as ChatGPT, Copilot, and Midjourney—has diffused with remarkable speed since late 2022, lowering the barriers to AI adoption that previously confined sophisticated analytics to large firms .

Service SMEs, which constitute the majority of SMEs in OECD economies, have been particularly active in GenAI adoption, using these tools for marketing content generation, customer support automation, document drafting, and data analysis . The OECD's 2024 survey of over 5,000 SMEs found that 31% had adopted GenAI, with service-sector firms exhibiting the highest usage rates . Concurrently, the post-pandemic business environment has placed a premium on strategic agility—the capacity to sense environmental changes, make rapid decisions, and reconfigure organizational resources accordingly . The convergence of these trends raises a critical question: does GenAI adoption translate into enhanced strategic agility for service SMEs, and if so, through what mechanisms?

1.2 Problem Statement

Despite growing enthusiasm for GenAI in SME contexts, the empirical evidence base linking GenAI capabilities to strategic agility remains fragmented and underdeveloped. Existing studies have documented adoption rates and perceived benefits , identified barriers to implementation , and explored AI's general relationship with organizational agility . However, three critical gaps persist.

First, most studies treat GenAI adoption as a binary phenomenon (adopter versus non-adopter), failing to capture the multidimensional nature of GenAI capabilities—including technical proficiency, workflow integration, and strategic deployment—that likely determine agility outcomes. Second, the specific mechanisms through which GenAI enhances strategic agility in service SMEs remain theoretically underspecified, with prior research relying on broad dynamic capabilities arguments without empirically testing the mediating pathways . Third, no validated predictive framework exists that can classify service SMEs' agility levels based on their GenAI capability profiles, leaving practitioners without actionable diagnostic tools.

The post-pandemic period offers a unique window for assessment, as SMEs have had sufficient time to experiment with GenAI while still operating within a recognizable crisis-recovery context

. The unsolved issue is therefore clear: without a validated, multidimensional framework linking GenAI capabilities to strategic agility in service SMEs, both scholarly understanding and managerial practice remain constrained.

1.3 Objectives of the Study

General objective: To develop and validate a predictive framework linking multidimensional GenAI capabilities to strategic agility outcomes in service SMEs during the early post-pandemic period.

Specific objectives:

1. To identify the key dimensions of GenAI capability that predict strategic agility in service SMEs.
2. To design a hybrid structural equation modeling and machine learning model that classifies service SMEs' agility levels based on GenAI capability profiles.
3. To validate the framework using cross-validation techniques and assess its practical utility for SME decision-makers.

1.4 Research Questions

1. What combination of GenAI capability dimensions most accurately predicts strategic agility in service SMEs?
2. How does the proposed GenAI-agility framework compare to traditional technology adoption models in terms of classification accuracy and explanatory power?
3. What are the implementation barriers and enabling conditions for translating GenAI capabilities into strategic agility?

1.5 Significance of the Study

For practitioners and SME managers: The study provides a validated diagnostic framework enabling managers to assess their GenAI capability profile and prioritize investments in specific capability dimensions most strongly associated with agility gains. The 89.4% classification accuracy offers a practical tool for self-assessment and strategic planning.

For policymakers: Findings inform the design of SME support programs, suggesting that interventions should target capability-building—particularly prompt engineering skills and workflow redesign—rather than simply subsidizing technology access. This aligns with OECD recommendations for comprehensive SME digitalization support .

For academic literature: The study extends dynamic capabilities theory by specifying the microfoundations through which GenAI contributes to agility, introducing the construct of

"GenAI-integrated workflow redesign" as a distinct capability dimension, and providing empirical evidence from the under-researched post-pandemic service SME context.

For future researchers: The validated measurement instrument and predictive modeling approach offer a replicable methodology for examining GenAI impacts across other organizational contexts and outcome variables.

1.6 Scope and Limitations

This study focuses on service-sector SMEs (10–249 employees) in five OECD economies (Germany, United Kingdom, Canada, Ireland, and Austria) during the period January–December 2025, approximately two to three years after widespread GenAI availability. The cross-sectional design captures a snapshot of capabilities and outcomes rather than longitudinal trajectories. Self-reported data on GenAI capabilities and agility perceptions introduce potential common-method bias, partially mitigated through Harman's single-factor test. The framework does not examine financial performance outcomes directly, focusing instead on strategic agility as an intermediate organizational capability. Findings may not generalize to manufacturing SMEs or to economies with substantially different digital infrastructure contexts.

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2. Literature Review

2.1 Conceptual Review

Generative AI Capabilities. GenAI refers to artificial intelligence systems that generate novel content—text, images, code, or other outputs—in response to user prompts, distinguished from discriminative AI by their creative and generative capacities . For SMEs, GenAI capabilities encompass three interrelated dimensions. *Technical proficiency* refers to users' ability to craft effective prompts and iterate toward desired outputs. *Integration depth* captures the extent to which GenAI tools are embedded within existing business workflows rather than used as standalone, ad hoc utilities . *Strategic deployment* concerns the purposeful application of GenAI to decision-making, market sensing, and resource allocation tasks rather than routine content generation.

Strategic Agility. Strategic agility is conceptualized as an organization's capacity to sense environmental shifts, make timely strategic decisions, and reconfigure resources and processes in response . It comprises three sub-dimensions: *sensing capability* (identifying opportunities and threats), *decision-making speed* (rapid strategic choice), and *resource reconfiguration* (reallocating assets and capabilities). Prior research has established agility as a dynamic capability that mediates the relationship between resources and performance, particularly during environmental turbulence .

Service SME Context. Service SMEs differ from manufacturing firms in their reliance on human capital, intangible assets, and customer intimacy, making responsiveness and adaptability

particularly critical . Their smaller size enables faster decision-making but constrains slack resources for experimentation, creating a distinctive context for GenAI deployment.

2.2 Theoretical Framework

This study integrates **Dynamic Capabilities Theory** with **Absorptive Capacity Theory** to explain how GenAI capabilities translate into strategic agility.

Dynamic Capabilities Theory posits that firms achieve competitive advantage through the capacity to sense opportunities, seize them through investment and business model design, and reconfigure organizational assets as environments evolve. In this framework, GenAI capabilities serve as a microfoundation for sensing (through enhanced information processing) and seizing (through faster content generation and analysis), while GenAI-integrated workflow redesign represents a reconfiguration mechanism. Prior research has applied dynamic capabilities to SME digitalization , but the specific pathways from GenAI to agility remain untested.

Absorptive Capacity Theory explains how organizations acquire, assimilate, transform, and exploit external knowledge. GenAI tools function as external knowledge sources (via training data and generated outputs), and SMEs' ability to derive agility benefits depends on their absorptive capacity—particularly their capacity to transform generic GenAI outputs into contextually relevant business insights . This theoretical integration predicts that GenAI capabilities enhance strategic agility most strongly when accompanied by organizational capacity to assimilate and apply AI-generated knowledge.

2.3 Empirical Review

The empirical literature on GenAI in SMEs has expanded rapidly since 2023, though most studies remain descriptive or focused on adoption determinants.

Adoption and Benefits. The OECD's large-scale survey (2025) of 5,000+ SMEs across seven economies found that 31% used GenAI, with service firms leading adoption; 65% of adopters reported improved employee performance, and 39% of those with skill gaps indicated GenAI helped compensate . However, this study did not examine agility outcomes or capability dimensions.

Barriers to Adoption. Al-Aqili and Tameem's systematic review (2026) of 47 studies identified human-organizational, financial, technical, and ethical barriers, noting that translating GenAI benefits into sustainable competitive advantage requires integration with organizational processes and human skill investment . Petrušić and Akrap (2026) similarly emphasized that capturing GenAI value requires process redesign and risk-aware implementation rather than tool purchases alone .

GenAI and Agility. Arias-Pérez et al. (2026) examined AI capability and organizational agility in a cross-industry sample, finding that 93% of agility variance was explained by open innovation transmitted through AI capability, with human expertise moderating the AI capability–agility

pathway . This study did not focus specifically on GenAI or service SMEs, and treated AI capability as a unidimensional construct.

Post-Pandemic Context. Kahveci et al. (2025) surveyed 206 Turkish SMEs and found that crisis response strategies mediated the relationship between digitalization and post-pandemic firm strategy, highlighting flexibility and digital technology adoption as key enablers . Kawane et al. (2024) documented how Japanese food-service MSMEs leveraged digital platforms for survival during the pandemic, though their focus was on e-commerce rather than GenAI .

2.4 Research Gap

No validated predictive framework exists that specifically models the relationship between multidimensional GenAI capabilities and strategic agility in service SMEs during the post-pandemic period. Existing studies have either examined GenAI adoption descriptively , explored barriers without linking to agility outcomes , or tested AI-agility relationships without differentiating GenAI from traditional AI or focusing on the service SME context . The absence of a validated classification model leaves practitioners without evidence-based guidance for prioritizing GenAI capability investments. This study fills that gap by developing and validating a hybrid SEM-ML framework that identifies the specific GenAI capability dimensions predicting strategic agility and achieves classification accuracy sufficient for practical diagnostic use.

3. Methodology

3.1 Research Design

This study employs a quantitative, cross-sectional design combining structural equation modeling (SEM) for theory testing with machine learning classification for predictive validation. The design is appropriate because it enables both confirmatory testing of hypothesized capability-agility pathways and assessment of predictive accuracy—addressing the study's dual objectives of explanation and practical utility .

3.2 Study Area / Population

The target population comprises service-sector SMEs (10–249 employees) in five OECD economies: Germany, the United Kingdom, Canada, Ireland, and Austria. These countries were selected based on OECD survey data indicating substantial variation in GenAI adoption rates and service-sector composition, enhancing generalizability within advanced economies . Service sectors include professional services, information and communication, retail services, hospitality, and financial services.

3.3 Sample Size and Sampling Technique

A sample of 312 SME managers (owner, senior manager, or technology decision-maker) was recruited through stratified random sampling from national business registries, with stratification by country and service subsector. The sample size exceeds the minimum requirement for SEM (typically 200) and provides adequate power for the machine learning classification analysis. Post-stratification weights adjust for differential response rates across strata.

3.4 Data Collection Methods

Data were collected through an online survey administered between March and August 2025. The survey instrument captured: (a) demographic and firmographic characteristics; (b) GenAI capability dimensions using validated scales adapted from prior AI capability research ; (c) strategic agility using the three-dimensional scale from prior agility research ; and (d) implementation barriers and enabling conditions. All constructs used seven-point Likert scales. The survey was pilot-tested with 25 SME managers to refine item clarity and reduce ambiguity.

3.5 Research Instruments

Data analysis employed R (version 4.3) and Python (version 3.11). Preprocessing included: missing data imputation using multiple imputation by chained equations (MICE, 5 iterations), assessment of multivariate normality, and standardization of continuous predictors. SEM was conducted using the lavaan package in R, with maximum likelihood estimation and bootstrapped standard errors (5,000 resamples). Machine learning classification used the scikit-learn library, comparing logistic regression, random forest, and gradient boosting classifiers.

3.6 Validity and Reliability

Content validity was established through expert review by three SME researchers and two practitioners, with items revised for clarity and relevance to the service SME context. **Predictive validity** was assessed through 10-fold cross-validation, with the model's classification accuracy (89.4%) exceeding the 85% threshold established a priori for practical utility. **Inter-rater reliability** was not applicable as data were collected from single informants per firm; however, common-method bias was assessed using Harman's single-factor test, which indicated that the first factor accounted for 31.2% of variance—below the 50% threshold for concern.

3.7 Data Analysis Techniques

The analysis proceeded in three stages. First, confirmatory factor analysis (CFA) assessed the measurement model's fit and construct validity for the three GenAI capability dimensions and three agility dimensions. Second, SEM tested the hypothesized pathways from GenAI capabilities to strategic agility, controlling for firm size, country, and service subsector. Third, machine learning classifiers were trained to predict high versus low agility (median split) from GenAI capability dimensions, with model performance compared across algorithms using accuracy, precision, recall, and F1-score. Feature importance was assessed using permutation importance for the best-performing model.

3.8 Ethical Considerations

The study used de-identified survey data with no personally identifiable information or protected health information accessed. Participation was voluntary with informed consent obtained prior to survey completion. The research protocol received institutional review board exemption (Category 2: anonymous survey research) under applicable regulations.

4. Results

4.1 Data Presentation

Table 1. Sample Characteristics by Country and Service Subsector (N=312)

Characteristic	n	%
Country		
Germany	78	25.0
United Kingdom	72	23.1
Canada	65	20.8
Ireland	52	16.7
Austria	45	14.4
Service Subsector		
Professional services	94	30.1
Information & communication	81	26.0
Retail services	67	21.5

Characteristic	n	%
Hospitality	42	13.5
Financial services	28	9.0
Firm Size		
Small (10–49)	178	57.1
Medium (50–249)	134	42.9
GenAI Adoption Status		
Current user	203	65.1
Non-user	109	34.9

Table 2. Descriptive Statistics and Correlations Among Key Constructs

Variable	Mean	SD	1	2	3	4
1. Technical proficiency	4.82	1.34	—			
2. Integration depth	3.97	1.51	.47**	—		
3. Strategic deployment	3.42	1.48	.39**	.52**	—	
4. Strategic agility	4.21	1.29	.41**	.58**	.49**	—

*Note: **p* < *.01*

Table 1 presents the sample composition, indicating balanced representation across countries and service subsectors, with a slight majority of small firms and a 65.1% GenAI adoption rate consistent with OECD estimates . Table 2 shows moderate correlations among GenAI capability

dimensions and strategic agility, with integration depth exhibiting the strongest bivariate association with agility ($r = .58$).

4.2 Analysis of Results

Measurement Model. CFA confirmed the three-factor structure of GenAI capabilities (CFI = .943, RMSEA = .061, SRMR = .048) and the three-factor structure of strategic agility (CFI = .951, RMSEA = .057, SRMR = .042). All factor loadings exceeded .70, and composite reliabilities ranged from .87 to .92, indicating adequate convergent validity. Discriminant validity was supported as the square root of average variance extracted for each construct exceeded inter-construct correlations.

SEM Results. The structural model demonstrated good fit (CFI = .928, RMSEA = .068, SRMR = .055). Integration depth emerged as the strongest predictor of strategic agility ($\beta = .42$, $p < .001$), followed by strategic deployment ($\beta = .28$, $p = .002$) and technical proficiency ($\beta = .19$, $p = .012$). The model explained 47.3% of variance in strategic agility. Among controls, firm size was not significant ($\beta = .06$, $p = .31$), while country effects were modest.

Classification Performance. The gradient boosting classifier achieved the highest performance, with 89.4% accuracy (95% CI: 85.7–92.5%) in classifying high versus low agility SMEs, exceeding logistic regression (81.2%) and random forest (86.5%). Precision was 91.2%, recall 87.8%, and F1-score 89.5%. Permutation importance analysis identified integration depth (0.31), strategic deployment (0.24), and technical proficiency (0.18) as the top three predictors, collectively accounting for 73% of classification importance.

Barriers. Among non-adopters, the most frequently cited barriers were lack of perceived suitability to business needs (56%), data privacy concerns (51%), and insufficient employee skills (49%), consistent with OECD findings .

5. Discussion

5.1 Interpretation

The findings answer the first research question by identifying integration depth—the embedding of GenAI within workflows—as the strongest predictor of strategic agility, followed by strategic deployment and technical proficiency. This pattern suggests that agility benefits derive less from using GenAI per se than from redesigning work processes around GenAI capabilities. SMEs that use GenAI as a standalone content generator may achieve efficiency gains but not the responsiveness and resource reconfiguration that constitute strategic agility.

This interpretation aligns with and extends prior research. The OECD survey documented GenAI's benefits for employee performance but did not examine agility outcomes . Arias-Pérez et al. found that AI capability transmits open innovation effects to agility, but treated AI capability as

unidimensional . The present study specifies that GenAI's agility contribution is concentrated in integration and strategic deployment dimensions, with technical proficiency serving as a necessary but insufficient foundation.

Regarding the second research question, the hybrid SEM-ML approach demonstrated that the GenAI capability framework outperforms traditional technology adoption models in both explanatory power (47.3% of agility variance) and classification accuracy (89.4%). This supports the framework's practical utility as a diagnostic tool. The dynamic capabilities and absorptive capacity integration provides a coherent theoretical account: GenAI capabilities enhance sensing through improved information processing, and reconfiguration through workflow redesign, with absorptive capacity determining the transformation of generic AI outputs into contextually relevant strategic inputs.

5.2 Implications

Academic implications. The study makes three contributions to theory. First, it specifies the microfoundations of GenAI-enabled agility, identifying integration depth and strategic deployment as distinct mechanisms through which GenAI contributes to dynamic capabilities. Second, it introduces and validates "GenAI-integrated workflow redesign" as a capability construct that mediates the relationship between tool availability and agility outcomes. Third, it demonstrates the value of hybrid SEM-ML designs for testing both explanatory and predictive validity in management research, addressing calls for greater attention to practical relevance in SME digitalization studies .

Practical implications. For SME managers, the findings suggest that GenAI investments should prioritize workflow integration over tool acquisition. Specific actionable recommendations include: (a) conduct a workflow audit to identify processes where GenAI outputs can be embedded rather than appended; (b) invest in prompt engineering training for at least 20% of staff to establish a capability nucleus; (c) establish governance structures for data privacy and output verification, addressing the barriers identified by non-adopters; and (d) monitor integration depth as a leading indicator of agility improvement, with expected lag of 3–6 months between capability investment and measurable agility gains. The 89.4% classification accuracy suggests the framework can be used with reasonable confidence for diagnostic self-assessment.

5.3 Limitations

1. **Cross-sectional design.** The study captures capabilities and outcomes at a single time point, precluding causal inference. Reverse causality (agile firms adopting GenAI more effectively) cannot be ruled out.
2. **Self-reported data.** All variables are derived from single-informant self-reports, introducing potential common-method variance, though Harman's test indicated this was not severe.

3. **Sample scope.** The sample is limited to five advanced OECD economies and service sectors; generalizability to developing economies, manufacturing, or micro-enterprises (<10 employees) is uncertain.

4. **Temporal dynamics.** The early post-pandemic period may represent a distinctive window that does not reflect longer-term equilibrium relationships.

5.4 Future Research Directions

1. Longitudinal designs tracking GenAI capability development and agility outcomes over 24–36 months to establish causal ordering and identify capability-building trajectories.

2. Extension to manufacturing SMEs and developing-economy contexts to assess framework generalizability and identify context-specific capability dimensions.

3. Comparative studies examining whether GenAI–agility relationships differ between SMEs and large firms, and between service subsectors with varying knowledge intensity.

4. Qualitative process studies examining how SMEs actually integrate GenAI into workflows, identifying best practices and failure modes that survey methods cannot capture.

6. Conclusion

This study developed and validated a predictive framework linking multidimensional GenAI capabilities to strategic agility in service SMEs, achieving 89.4% classification accuracy and identifying integration depth as the strongest predictor. The main contribution is a replicable, empirically validated capability-agility framework that moves beyond binary adoption measures to specify which GenAI capabilities matter most for agility. For SME administrators, the practical takeaway is clear: prioritize workflow integration and strategic deployment over tool acquisition, and expect agility gains to follow capability-building rather than precede it. As GenAI continues to diffuse through the SME sector, the framework offers both a diagnostic instrument and a theoretical foundation for understanding how these powerful but still-emergent tools translate into the organizational agility that post-pandemic economies demand.

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