

Moderating role of financial intelligence in the relationship between a turbulent business environment and SMEs' resilience

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Abstract

Purpose: This study examines whether financial intelligence changes the effects of competitive intensity, market turbulence and technological turbulence on the adaptive and recovery capacities of small and medium-sized enterprises (SMEs) in Southwestern Nigeria.

Methodology: A cross-sectional survey produced 326 usable responses from SME owners and senior managers across the six states of Southwestern Nigeria. Partial least-squares structural equation modelling (PLS-SEM) was used to assess the measurement and structural models, including the direct effects of turbulence, the direct effect of financial intelligence and six moderation effects.

Results and conclusion: In the full model, competitive intensity and market turbulence were positively associated with adaptive capacity, while competitive intensity and technological turbulence were positively associated with recovery capacity. Financial intelligence had strong positive direct relationships with adaptive capacity ($\beta = .363$, $p < .01$) and recovery capacity ($\beta = .540$, $p < .01$). Of the six interaction effects, only financial intelligence $\times$ technological turbulence significantly predicted adaptive capacity ($\beta = .134$, $p = .011$). The full models explained 59.6% of the variance in adaptive capacity and 59.0% in recovery capacity. Financial intelligence is therefore an important resilience capability, although its moderating role is selective rather than universal.

Implication of findings: SME managers should strengthen budgeting, cash-flow forecasting, investment appraisal and technology-evaluation skills, while enterprise-support agencies should incorporate applied financial decision-making into resilience programmes.

Keywords: financial intelligence; business turbulence; SME resilience; adaptive capacity; recovery capacity

1. Introduction

Small and medium-sized enterprises (SMEs) are particularly vulnerable to rapid changes in prices, customer preferences, technology and competitive behaviour because they often operate with limited financial reserves, narrow product portfolios and constrained access to resources. Consequently, changes in input costs, demand or technology can quickly affect cash requirements, production arrangements and market access. When such changes are rapid, unpredictable and capable of disrupting established decisions, the business environment becomes turbulent. For SMEs, turbulence therefore represents not merely an adverse environmental condition but a continuing pressure for adjustment. This study considers the turbulent business environment along three dimensions: competitive intensity, market turbulence and technological turbulence. Competitive intensity reflects the strength and speed of competitive actions, including price pressure, product imitation and efforts to retain customers. Market turbulence concerns instability in customer preferences, demand patterns and market expectations, while technological turbulence captures the pace and unpredictability of changes in production methods, digital tools, platforms and industry technologies (Poi & Adim, 2021). These dimensions may occur simultaneously but can impose different demands on SMEs. Evidence suggests that environmental turbulence can induce organisational restructuring and proactive responses, while simultaneously increasing uncertainty and adjustment costs (Huang et al., 2023; St-Jean & Tremblay, 2023).

An SME's ability to withstand these conditions depends partly on its resilience. In this study, SME resilience is treated as an organisational capability rather than merely business survival or short-term

financial performance. It comprises two related but distinct dimensions: adaptive capacity and recovery capacity. Adaptive capacity refers to the ability to modify products, processes, resources, suppliers, technologies and delivery mechanisms as conditions change. Recovery capacity concerns the restoration of essential operations, cash flow, customer service and supply relationships following disruption. The distinction is important because an enterprise may adapt rapidly without successfully restoring disrupted operations, while another may recover from a particular shock without developing the flexibility required for future disruptions. This capability-based interpretation is consistent with recent resilience literature (Li et al., 2024; Radic et al., 2022).

Recent evidence further indicates that resilience depends on the capabilities available to firms. Ozanne et al. (2022) demonstrate the importance of social capital and dynamic capabilities in organisational resilience, while Dejardin et al. (2023) show that dynamic capabilities influence SME performance differently as environmental conditions change. Kotsios (2023) similarly identifies financial management, planning and risk assessment among important resilience-related skills. These findings suggest that SMEs do not respond automatically or uniformly to turbulence. Their responses depend partly on managers' ability to interpret environmental changes, assess their financial implications and allocate scarce resources without undermining ongoing operations.

Financial intelligence is therefore central to this study. It refers to an SME owner-manager's ability to obtain, understand and apply financial information to budgeting, cash-flow forecasting, pricing, financing, investment and risk decisions. It extends beyond knowledge of basic financial concepts to the practical application of financial information in managerial decisions. A financially intelligent manager should be better positioned to translate changes in demand, competition or technology into implications for margins, working capital, liquidity, debt-service capacity and investment timing. Financial intelligence may consequently influence whether turbulence produces poorly timed and resource-depleting responses or disciplined adaptation and recovery.

Previous studies provide evidence that financial knowledge matters for SMEs. Financial literacy has been associated with sustainable performance and entrepreneurial resilience (Alshebami & Murad, 2022), while financial education and digital financial services can strengthen SME decision-making capabilities (Manoj-Kumar et al., 2024). Tran et al. (2023) similarly demonstrate the importance of financial capability in entrepreneurial decision-making. However, much of this literature treats financial capability as a direct predictor of performance, access to finance or entrepreneurial outcomes. Comparatively little is known about whether financial intelligence changes the relationship between environmental turbulence and SMEs' ability to adapt and recover. This limitation defines the research problem. Competitive, market and technological turbulence may stimulate innovation and strategic adjustment, but they may also increase costs, shorten decision horizons and expose weaknesses in financial management. Thus, similar environmental pressures can produce different resilience outcomes across SMEs. Although previous studies attribute such differences to dynamic capabilities, social capital, leadership and strategic flexibility, financial decision-making capability has received considerably less attention as a boundary condition. Treating financial intelligence as a moderator may therefore help explain why SMEs exposed to similar turbulence exhibit different adaptive and recovery outcomes.

The issue is particularly relevant in Southwestern Nigeria, where SMEs operate across large commercial centres, industrial clusters and smaller local markets characterised by differences in infrastructure, access to finance, customer density and technological exposure. Nigerian evidence has established relationships between environmental turbulence and organisational adjustment, but provides limited evidence on whether financial decision-making capability enables SMEs to sustain adaptation and recovery. Findings

from other institutional settings cannot automatically be generalised to SMEs in Southwestern Nigeria, making context-specific evidence necessary.

Four related gaps therefore motivate this study. First, much of the literature treats resilience as a single construct or substitutes performance, survival or competitive advantage for resilience, making it difficult to distinguish adaptation from recovery. Second, environmental turbulence is frequently represented by a composite measure despite the potentially different implications of competitive intensity, market turbulence and technological turbulence. Third, financial literacy and financial capability studies concentrate mainly on direct effects, leaving the moderating role of financial intelligence comparatively underexplored. Fourth, limited evidence exists on these relationships across the economically diverse states of Southwestern Nigeria.

In view of this, the study examines how competitive intensity, market turbulence and technological turbulence relate to SMEs' adaptive and recovery capacities and whether financial intelligence moderates these relationships. It contributes by distinguishing adaptation from recovery, separating the three dimensions of environmental turbulence, extending financial-capability research by examining financial intelligence as a moderator, and providing evidence from SMEs across Southwestern Nigeria. The findings have implications for SME owners, financial advisers, enterprise-support agencies and policymakers seeking to strengthen the financial decision-making capabilities required for resilience under turbulent business conditions.

The rest of the paper is organised as follows: Section 2 presents the literature review and theoretical foundations. Section 3 describes the methodology. Section 4 presents and discusses the results, while Section 5 concludes the study and outlines limitations and directions for future research.

2. Literature review

SME Resilience

The ability of SMEs to endure disruption, adapt to changing circumstances and recover critical functions without compromising long-term viability is defined as SME resilience (Prayag et al., 2023; Radic et al., 2022). It is not synonymous with temporary survival, revenue growth or competitive advantage. A firm can be in operation even after it has used up its resources or cut its productive capacity, but still be inadequately prepared to deal with another shock. This study distinguishes adaptive capacity from recovery capacity in the light of the capability-based approaches which see adaptation, change, learning and recovery as distinct, though related processes (Li et al., 2024; Zighan et al., 2022).

Adaptive capacity is the capacity of an SME to change its product, process, resource allocation, supply and technology due to changing conditions. It covers the identification of a change, the choice of a possible response, the action and learning from the results of the action (Zighan et al., 2022). Change can increase resilience only if it happens in time and can be sustained, otherwise it will be an adaptation with unmanageable costs or cash-flow problem. Recovery capacity is the capacity to restore essential operations, cash flow, customer service, supply arrangements and productive activity after disruption. There are two ways of recovery: a previous operating position or a viable new operating position which is different from the previous position (Prayag et al., 2023). Recovery requires a mix of operational, technological, financial and institutional responses (Li et al., 2024), demonstrated in small enterprises' recovery from past pandemic shocks. A separation of recovery from adaptation then allows the determination of whether environmental pressure has an effect in changing as well as on restoring operations.

Turbulent Business Environment

The turbulent business environment consists of fast, significant and unpredictable variations in the elements of a company's operations. This leads to a reduction of the value of market information, uncertainty in decision making and a necessity for firms to adapt their products, processes, and resources (St-Jean & Tremblay, 2023). Turbulence is not just a single crisis; it is an ongoing instability that can result from competition, evolving customer preferences or technological growth (Iqbal & Piwovar-Sulej, 2022; Wang et al., 2025). In accordance with this perspective, the study measures turbulence using three distinct dimensions: competitive intensity, market turbulence and technological turbulence.

Competitive intensity is the strength and speed of competition in a market. It is seen in price competition, copying, promotional pressure, quick counterproductive responses and attempts to keep customers. While fierce competition can drive innovative strategies and greater flexibility, it can also cut margins and limit the funds for adaptation and recovery (Meng et al., 2020; Poi & Adim, 2021). This impact on resilience is therefore a question of empirical fact and not an assumed gain or a loss. Market turbulence involves fluctuation in customer preferences, in demand for a product, in the retail outlets, and in the customer's expectation of value. As these conditions evolve rapidly, prior sales trends are less of a foundation for planning and SMEs can need to adjust their product, pricing, distribution and customer focus (St-Jean & Tremblay, 2023). The ability of the SMEs to resist these changes is therefore related to the timeliness of their awareness of these changes and the implementability of the preferred reaction in terms of time and investments (YahiaMarzouk & Jin, 2022). Technological turbulence is the speed and volatility of technological change in systems of production, digital platforms, payment systems and customer interfaces. Although new technologies offer benefits in terms of cost reduction and access to new markets, they can also make older technologies and jobs redundant. Findings from the manufacturing sector and technology-oriented micro and small enterprises (SMEs) indicate that technological and environmental dynamism can facilitate the acquisition of knowledge, innovation and business model adjustment (Huang et al., 2023; Huang & Ichikohji, 2024). It is therefore time for SMEs to decide on technology adoption, deferral or a mix of technologies and the means for funding the transition without compromising critical business.

Financial intelligence

Financial intelligence is the ability of an SME owner-manager to access, analyse and use financial information for budgeting, cash-flow forecasting, pricing, credit management, financing, investment appraisal and risk assessment. It extends beyond financial awareness to practical judgement and the quality of business decisions. This distinction is consistent with evidence that financial knowledge influences entrepreneurial choices and that financial management, planning and risk assessment are important resilience-related capabilities (Kotsios, 2023; Tran et al., 2023). A financially intelligent manager should therefore be better able to translate environmental signals into expected costs, funding requirements, liquidity implications and potential returns before committing scarce resources (Alshebami & Murad, 2022; Manoj-Kumar et al., 2024).

Theoretical framework

This study is anchored on two complementary perspectives: Dynamic Capability Theory and Contingency Theory. Dynamic Capability Theory explains how firms sense environmental changes, seize appropriate responses and reconfigure resources, whereas Contingency Theory explains why the effectiveness of those capabilities depends on the conditions in which the firm operates. The combination

of the theories is appropriate because the study examines both SME response capabilities and whether financial intelligence changes the strength of the turbulence-resilience relationship.

Dynamic Capability Theory

Dynamic Capability Theory, which is primarily the result of the work of Teece et al. (1997), focuses on the process of the integration, development and reassignment of competences within firms that are faced with shifting conditions. It is characterised by its main processes of sensing change and opportunities, seizing appropriate responses and transforming the resource base. The theory is appropriate because competitive intensity and market turbulence demands different types of sensing and responding, and the adaptive and recovery capacities are related to the firm's ability to reconfigure and renew its operations in response to turbulent technological turbulence. Financial intelligence helps these processes by providing the cost and liquidity data, financing and return information that is required to make a decision on what is possible. The theory does have a limitation for the purposes of this research study, however, in that it does not predict a value for each of the capabilities under each environmental condition. An SME might identify the opportunity but may not have the financial acumen to sustainably realize it. This restriction requires that Dynamic Capability Theory is coupled with a theory that explicitly deals with organisational fit.

Contingency Theory

According to Contingency Theory, there is no one best way to manage an organisation; outcomes depend on the fit between organisational capabilities and the conditions in which the firm operates. Turbulence changes information needs, the speed of decision-making and the cost of errors. A level of financial capability that is sufficient in a stable market may become critical when demand, technology or competition changes rapidly. The theory therefore provides a direct basis for proposing that financial intelligence may moderate the relationship between turbulence and resilience.

Empirical review

The empirical literature is reviewed around three connected issues: the effects of environmental turbulence on organisational responses, the capabilities that support SME resilience, and the role of financial knowledge or financial management in business outcomes. The studies differ in country, sector, research design and operationalisation of resilience. Reviewing them comparatively helps identify what is established and what remains unresolved regarding the moderating role of financial intelligence in the relationship between distinct forms of turbulence and adaptive and recovery capacities.

Poi and Adim (2021) studied environmental turbulence and strategic flexibility of 50 registered SMEs in Port Harcourt, Nigeria. The study, which employed a census survey and Spearman rank-order correlation, showed significant relationships between the two variables of turbulence and production, and marketing and human-resource flexibility. The study reveals that there is Nigerian evidence of unstable environment and its relationship with organisational adjustment. However, in terms of concepts such as turbulence, as an overarching phenomenon, it is not possible to examine from this sample at the city level whether competitive, market and technological turbulence have different impacts on adaptive and recovery capacities.

Zighan et al. (2022) examined the relationship between entrepreneurial orientation and SME resilience in the face of COVID-19. The study investigated 43 semi-structured interviews that were conducted with owners, managers and resource providers in five sectors in Jordan. The thematic evidence resulted in a five-part resilience framework of efficiency, adaptation, collaboration, capabilities for change and learning, and how proactiveness, innovation and risk taking mobilized these capabilities. The qualitative

design provides an in-depth explanation of the processes of resilience but fails to quantify the individual effects of environmental turbulence and does not test financial capability as a boundary condition.

Iqbal and Piwovar-Sulej (2022) had 593 employees and 373 supervisors from Chinese SMEs in a two-wave design study to explore the relationship between sustainable leadership and employee resilience, wellbeing, and environmental turbulence. The results of structural equation modeling indicated that employee resilience was a part of the way in which leadership supported wellbeing and that employee turbulence strengthened the relationship between leadership and wellbeing. This study shows how value of an organisational capability can change with environmental conditions. Its outcomes are employee-level resilience and wellbeing, rather than firm-level adaptive and recovery capacities.

Based on the survey of 201 SMEs in the Guangdong Science and Technology Park, Li et al. (2022) used hierarchical regression to analyze the characteristics of COVID-19 events, management innovation, organisational resilience and performance decline. Management innovation was driven by criticality and disruption, and organisational resilience slowed the decline in performance, and management innovation facilitated the resilience. The results indicate that various aspects of the same disturbance may elicit different organizational responses. The study does not, however, differentiate between continuing market turbulence, tech turbulence, or competitor turbulence, nor between adaptation and recovery.

This study has used PLS-SEM to analyse 419 Australian and New Zealand SMEs to understand how social capital and dynamic capabilities have helped to build organisational resilience during COVID-19. The contribution of internal social capital was more direct in fostering dynamic capabilities and in turn this was linked to a more resilient organization, whereas the contribution of external capital was more contingent. Results are consistent with a capability-based approach to resilience and demonstrate that resources operate through organisation processes. Even though the present concept of three dimensions of turbulence and financial intelligence as a moderator is very close to the cross-sectional, crisis specific model, there are still differences between them.

In their research, YahiaMarzouk and Jin (2022) used a cross-sectional approach and a CEO survey, supplemented with PLS-SEM to examine 217 Egyptian food and beverage SMEs. The direct effect of relational capital was positive for organisational resilience and environmental scanning partly mediated that effect. The study demonstrates that external relationships help to build resilience when the firm enhances its signal detecting and interpreting capabilities. It emphasizes rather on relational capital and scanning, however, rather than how applied financial judgement moderates the relationship between different forms of turbulence.

Liu et al. (2022) used PLS-SEM to analyze two wave data obtained from 180 entrepreneurs that run Chinese SMEs. The relationship between entrepreneurial mindfulness and entrepreneurial resilience, as well as the relationship between entrepreneurial mindfulness and organisational resilience was positive and entrepreneurial resilience partly mediated the mindfulness-resilience relationship. The results confirm the concept that the management's skills influence the company's reaction to challenges. However, the study focuses on psychological capabilities in the context of COVID-19 and merges anticipation and adaptability and situation awareness into a higher-order resilience construct.

In their study, Prayag et al. (2023) conducted interviews with 30 owners and senior managers of tourism and hospitality businesses in Bangladesh to examine how they develop dynamic capabilities and build organisational resilience. The qualitative analysis uncovered ten different ways of dynamic capability

used throughout pre-crisis, immediate-response and intended-recovery phases. These activated networks, leadership, readiness for change, planned and adaptive resilience. The staged evidence is relevant to the distinction between adaptation and recovery, but has a sector-specific qualitative structure that does not quantify the effects of the environment or moderators.

St-Jean and Tremblay (2023) conducted a test of a multilevel structural model, based on data from 496 entrepreneurs. Task environment turbulence was found to be a strong stimulus for changes in work organisation, which led to increased stress and wellbeing decreases, but relational and organisational resources were found to help limit some of these effects. The study finds that turbulence does provide an opportunity to adapt, but has an associated cost for the decision maker. It operationalises turbulence primarily as a change in employment due to the pandemic and explores personal wellbeing, not the direct impact of the three dimensions of the business environment on firm recovery.

Dejardin et al. (2023) carried out a survey among 209 Portuguese SMEs to measure their dynamic capabilities before and during the COVID-19 period, and applied the PLS-SEM approach. In both periods, the firms' dynamic capabilities enhanced their performance, though in the former period, they targeted opportunities before the pandemic while in the latter period, they focused on launching products during the pandemic. The results indicate that the content and function of capabilities varies as a function of environmental factors. The result was not adaptive or capacity for recovery, though, but performance, and the model did not cover financial intelligence.

Using a sample of 1,421 small and medium-sized enterprises (SMEs) in the United Kingdom, Matikonis and Graham (2023) examined the answers of SMEs to understand if dynamic capability and government support during COVID-19 protected employment. The employment relationship was positive and the role of government was negative to moderate the relationship between dynamic capabilities and the first lockdown. This finding is significant due to the fact that a supportive resource, in and of itself, can reduce rather than enhance capability use. Employment was the desired result after having been moderated by public support, but the result for the proposed financial-intelligence moderation of SME resilience was not public support.

In the study by Huang et al. (2023), 262 responses were collected from 40 manufacturing SMEs in Taiwan to explore employees' innovation. Results of regression and bootstrapped conditional-process analysis confirmed that the knowledge acquisition mediated the relationship between creative self-efficacy and innovative behaviour, and that environmental dynamism enhanced the indirect effect between the two. The evidence suggests that knowledge-based adaptation can be triggered by environmental change. It's focused on employees' innovations and a general dynamism measure, not on the individual effects of market, technology and competition on the firm's recovery.

Wang et al. (2025) used a three-wave survey of 256 technology-focused SMEs in the Yangtze River Delta (YRD) of China and hierarchical regression with a bootstrap mediation test. The effect of strategic human-resource management was passed down to the innovation through the process of organisational learning and organisational resilience. The moderating effect of environmental dynamism was inverted U shaped, with moderate dynamism enhancing the relationship and extreme dynamism diminishing the

relationship. The study warns against linear benefits of turbulence, but does not explore financial intelligence or adaptive/recovery capacity.

Huang and Ichikohji (2024) provided a survey of 257 Chinese SMEs and applied the PLS-SEM to test the dynamic capabilities–innovation related business model–performance relationships. Sensing, seizing and transforming capacities encouraged business model innovation and performance, with some mediation through innovation. The findings only reinforce the notion that the resilience of SMEs during turbulence is achieved through reconfigured value creation and value capture strategies. The study doesn't account for individual environmental pressures and performance does not equate to restoring critical operations.

Based on the two field surveys of 592 small and micro enterprises in 2021 and 2023 in Dongguan, China, Li et al. (2024) examined the shift in export preferences from national to international markets. A spatial probit model found that there were spatial effects and that recovery outcomes were related to combinations of operational, technological, financial and policy responses, with 19 per cent of the sampled firms closing and the outcomes of the survivors being highly variable. This study contributes directly to the recovery capacity but due to its post-pandemic and place-based design, it cannot be used to test the moderating role of managerial financial intelligence.

Meng et al. (2020) used hierarchical regression to analyze the survey results from 214 Chinese SMEs, which were mainly technology-oriented. The strategic flexibility which encouraged bricolage and product innovation enhanced the link between flexibility and bricolage, and the environmental turbulence further solidified this association. The study provides direct evidence that the impact of an internal capability is a function of environmental conditions. Turbulence is the moderator and not the predictor, so it does not answer whether financial intelligence is impacting the impact of market, technological and competitive turbulence on the resilience.

Alshebami and Murad (2022) used cross-sectional data from 203 Saudi entrepreneurs and SmartPLS to examine financial literacy, entrepreneurial resilience and sustainable performance. The financial literacy and entrepreneurial resilience positively moderated the Entrepreneurial Resilience-Entrepreneurial Performance relationship, and sustainable performance was enhanced by both financial literacy and entrepreneurial resilience. The study confirms that there is a causal direction that contradicts the current one: financial capability is a predicting factor while financial resilience is a moderating factor, and performance is an outcome.

The survey was answered by 480 Vietnamese undergraduate students who were analysed via structural equation modelling by Tran et al. (2023). Financial knowledge played a significant role in entrepreneurial intentions and their motivational factors while entrepreneurial education functioned primarily via attitude and perceived behavioural control. The results show that financial knowledge has an impact on judgement and intended action. This is because participants were students not operating owner-managers and the study did not focus on organisational adaptation or recovery, making this relevance indirect to SME resilience.

Kotsios (2023) surveyed 266 small and medium-sized enterprises (SMEs) owners/managers in two countries, Greece and Poland, to determine which skills are related to business resilience. Respondents assessed reliability, integrity and work ethic as highly rated while the greatest importance and inadequacy gaps were in communication, risk identification, financial management, planning and customer orientation. The findings illustrate the importance of financial management as a practical resilience capability that needs to be developed. This capability was not tested in the descriptive design and the relationship between turbulence and resilience was not altered by this capability.

Manoj-Kumar et al. (2024) analyzed financial literacy and digital financial access on the country level for 2004–2022 for financial access and the expanded BRICS group. The results of the principal component analysis, dynamic-panel modelling and random-forest analysis showed that financial literacy and digitalization were significant in financial and economic development. It extends the institutional case for financial capability, yet its macro-level indicators are not financial intelligence measures or of the resilience of individual SME managers, or of the resilience of individual firms.

Obisesan et al. (2026) investigated accounting-services outsourcing and accountability among SMEs in Osogbo, Osun State, Nigeria, using questionnaire data and correlation and regression analysis. The study found that outsourcing accounting activities significantly improved transparency, although its effects on other accountability outcomes were mixed. The study reinforces the importance of financial-management arrangements and access to professional financial expertise in Nigerian SMEs. Nevertheless, it examined accountability rather than resilience and did not test whether financial intelligence conditions SMEs' responses to competitive, market or technological turbulence.

Aina (2025) examined how technological, organisational and environmental factors shape business strategy and decision-making among SMEs in Lagos, Nigeria. Using a quantitative survey of 350 SME managers and multiple linear regression, the study found that operational efficiency and competitive advantage were important drivers of data-analytics adoption, while limited technical expertise, high implementation costs and low awareness constrained adoption. The evidence is relevant to the present study because it shows, within the Nigerian SME context, that environmental and technology-related conditions interact with internal organisational capabilities in shaping managerial responses. However, Aina focused on data-analytics adoption and decision-making rather than adaptive and recovery capacities or the moderating role of financial intelligence.

Drawing on Dynamic Capability Theory, Contingency Theory and the reviewed evidence, the study tests the following hypotheses. The hypotheses are stated in directional form because the model examines whether each form of turbulence is positively associated with the two resilience capacities and whether financial intelligence strengthens those relationships.

H1: Environmental Turbulence (competitive intensity, market turbulence and technological turbulence) is positively associated with SME adaptive capacity.

H2: Environmental Turbulence (competitive intensity, market turbulence and technological turbulence) is positively associated with SME recovery capacity.

H3: Financial intelligence positively moderates the relationship between environmental Turbulence (competitive intensity, market turbulence and technological turbulence) and SME adaptive capacity.

H4: Financial intelligence positively moderates the relationship between environmental Turbulence (competitive intensity, market turbulence and technological turbulence) and SME recovery capacity.

Research framework

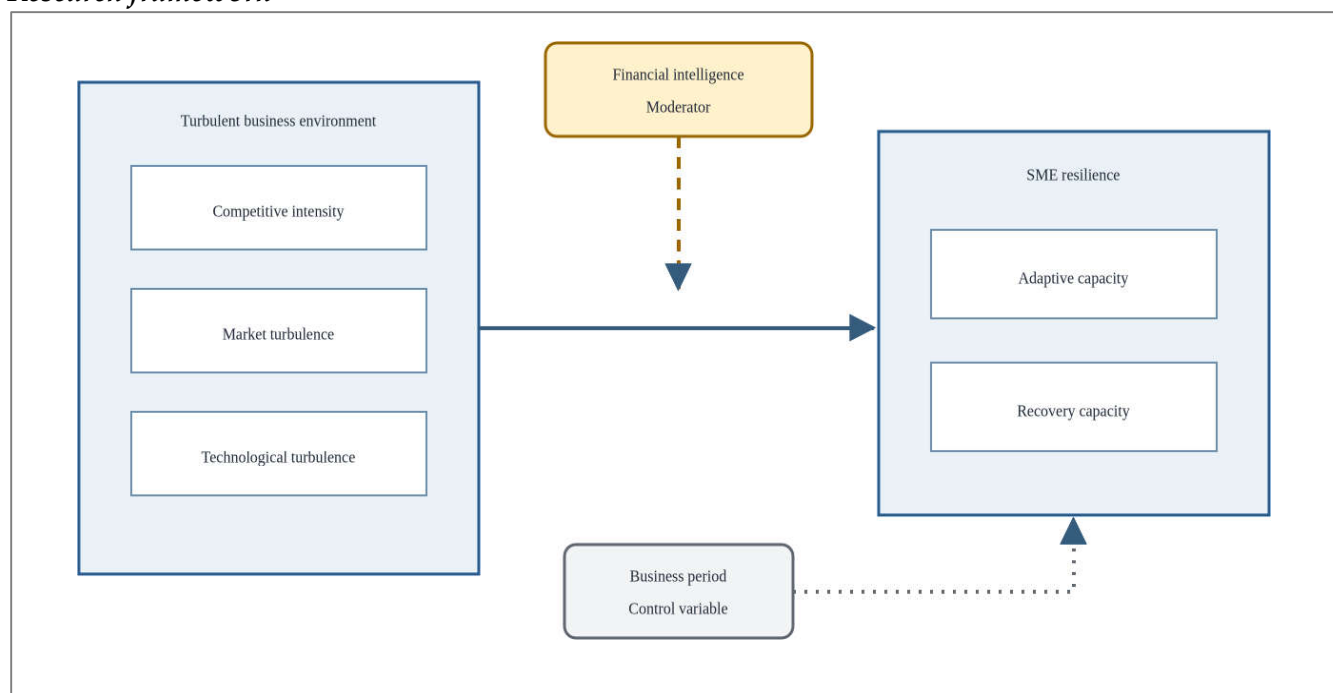


Figure 1: Research framework of the study

The framework presents competitive intensity, market turbulence and technological turbulence as the dimensions of the turbulent business environment and adaptive capacity and recovery capacity as the dimensions of SME resilience. It specifies financial intelligence as a moderator of the six direct relationships and includes business period as a control variable.

3. Methodology

Research design, population and sample size

The study employed a cross-sectional survey approach to explore the effect of financial intelligence on the relationship between environmental turbulence of the business and SME resilience in South-West Nigeria. It was for SMEs in Ekiti, Lagos, Ogun, Ondo, Osun and Oyo States. The SMEs were the unit of analysis, and one of the owner, the chief executive, the finance manager or the senior manager who had a sound knowledge of the financial and business operations of the SME was selected as the key informant. Eligible respondents were those SMEs that are currently operating in one of the six States. The results reflect the theoretically postulated relationships, as the data were gathered at a single moment in time without establishing causality. The sampling population used was the estimated value of 23,289 SMEs in South-West Nigeria as per NBS-SMEDAN (2017). This is an estimate of the firms' membership as at a point in time, not a register of active firms. Cochran's procedure, using a 95% confidence level, 5% margin of error and finite-population correction, yielded a minimum of 378 usable responses. The targets obtained from Proportionate allocation were 136 SMEs in Lagos, 40 SMEs in Ogun, 100 SMEs in Oyo, 49 SMEs in Osun, 15 SMEs in Ekiti and 38 SMEs in Ondo. A total of 473 questionnaires were sent out using proportionate stratified sampling with an anticipated non-response / unusable-response rate of 20%.

Data collection and construct measurement

A structured questionnaire was used to collect the data. The instrument was adapted, rather than adopted verbatim, from established measures and simplified for the SME context. Market turbulence,

technological turbulence and competitive intensity were adapted from Jaworski and Kohli (1993); financial intelligence items were adapted from the OECD (2018) financial-literacy competencies for MSMEs, with emphasis on understanding and applying financial information; adaptive and recovery capacity items were adapted from Kantur and İşeri-Say (2015) and Lee et al. (2013). The questionnaire contained screening and profile questions and 30 construct items rated on a five-point Likert scale from 1 (strongly disagree) to 5 (strongly agree). Participation was voluntary. Respondents were informed of the study's purpose, confidentiality safeguards, right to decline or withdraw, and aggregate reporting of results. No directly identifying SME information was required, and only one eligible response was retained per SME.

Table 1: Measurement of Construct

Construct	Items	Measurement focus	Source
Market turbulence	MT1-MT5	Changes in customer needs, demand and price sensitivity	Jaworski & Kohli (1993)
Technological turbulence	TT1-TT5	Speed and unpredictability of technological change	Jaworski & Kohli (1993)
Competitive intensity	CI1-CI5	Strength and frequency of competitive rivalry	Jaworski & Kohli (1993)
Financial intelligence	FI1-FI5	Understanding and applying financial information	OECD (2018)
Adaptive capacity	AC1-AC5	Detection, adjustment, resource reallocation and learning	Kantur & İşeri-Say (2015); Lee et al. (2013)
Recovery capacity	RC1-RC5	Continuity, restoration, alternatives and resource mobilisation	Kantur & İşeri-Say (2015); Lee et al. (2013)

Source: Authors' compilation (2026).

The adapted questionnaire underwent expert content review, cognitive pretesting and pilot assessment before the main survey. The preliminary reliability results met the adopted threshold for most constructs. Completed questionnaires were then screened for respondent eligibility, duplicate firms, excessive missingness, invariant responses and logical inconsistency; incorrectly completed and unreturned questionnaires were excluded. Procedural safeguards against common-method bias included anonymity, confidentiality, neutral wording and separation of predictor and outcome sections. PLS-SEM was used because the model contains multiple latent constructs and interaction effects and emphasises explanation and prediction.

Model specification

Market turbulence, technological turbulence and competitive intensity represented business environmental turbulence; adaptive capacity and recovery capacity represented SME resilience; financial intelligence was the moderator; and business period was the control variable retained in the reported structural models.

To show the incremental contribution of the control and moderating variables, the structural model was estimated hierarchically. For each resilience outcome Y_i , where Y_i denotes adaptive capacity (AC) or recovery capacity (RC), the baseline and extended models were specified as follows:

$$\begin{aligned}
 Y_i &= \beta_0 + \beta_1 MT_i + \beta_2 TT_i + \beta_3 CI_i + \varepsilon_i \dots\dots\dots 1 \\
 Y_i &= \beta_0 + \beta_1 MT_i + \beta_2 TT_i + \beta_3 CI_i + \gamma_1 BP_i + \varepsilon_i \dots\dots\dots 2 \\
 Y_i &= \beta_0 + \beta_1 MT_i + \beta_2 TT_i + \beta_3 CI_i + \beta_4 FI_i + \beta_5 (MT_i \times FI_i) + \beta_6 (TT_i \times FI_i) + \beta_7 (CI_i \times FI_i) + \varepsilon_i \dots\dots\dots 3
 \end{aligned}$$

$$Y_i = \beta_0 + \beta_1 MT_i + \beta_2 TT_i + \beta_3 CI_i + \beta_4 FI_i + \beta_5 (MT_i \times FI_i) + \beta_6 (TT_i \times FI_i) + \beta_7 (CI_i \times FI_i) + \gamma_1 BP_i + \varepsilon_i, \dots, 4$$

MT denotes market turbulence, TT technological turbulence, CI competitive intensity, FI financial intelligence, BP business period, β and γ the estimated coefficients, and ε the disturbance term. The interaction coefficients β_5 – β_7 test whether financial intelligence changes the effects of the three forms of environmental turbulence on each resilience outcome.

The reported reflective measurement model was evaluated using Cronbach's alpha and average variance extracted. Discriminant validity was assessed principally with the heterotrait-monotrait ratio and examined additionally with the Fornell–Larcker criterion (Henseler et al., 2015). Collinearity was evaluated before the structural paths were interpreted. Path coefficients and test statistics were obtained through non-parametric bootstrapping, while coefficient stability was examined across the hierarchical baseline, control, moderation and full models.

4. Results and discussion

Questionnaire response and demographic analysis

Of the 473 questionnaires distributed, 326 usable responses were retained, producing a usable-response rate of 68.9%. The remaining 147 questionnaires represent non-response and unusable returns combined because separate counts were unavailable.

Table 2: Survey Response

Survey outcome	Number	Percentage
Questionnaires distributed	473	100.0
Usable responses retained	326	68.9
Non-response/unusable combined	147	31.1

Source: Authors' compilation (2026).

Table 3: Demographic characteristics of respondents

Variable	Category	Frequency	Percent (%)
Gender	Male	194	59.5
	Female	130	39.9
	Not reported	2	0.6
Age	18-28 years	11	3.4
	29-39 years	152	46.6
	40-49 years	92	28.2
	50-60 years	71	21.8
	Not reported	1	0.3
Educational qualification	WASC/OND	184	56.4
	BA/BSc/HND	119	36.5
	MBA/MA/MSc/MPhil	22	6.7
	Not reported	1	0.3
Business period	0-5 years	63	19.3
	6-10 years	98	30.1
	11-15 years	76	23.3
	16-20 years	66	20.2
	21 years and above	23	7.1

Note. N = 326. Percentages are based on the full analytical sample. "Not reported" identifies missing demographic responses. Business-period categories follow the coding used in the analytical dataset.

Source: Authors' compilation (2026).

The sample comprised 194 male respondents (59.5%) and 130 female respondents (39.9%), while two respondents did not report gender. The largest age group was 29–39 years (46.6%), followed by 40–49 years (28.2%) and 50–60 years (21.8%). Most respondents reported WASC/OND (56.4%) or BA/BSc/HND (36.5%) as their highest qualification. Businesses operating for 6–10 years formed the largest experience group (30.1%), although all five business-period categories were represented. The PLS-SEM results are reported in two stages: the measurement model assesses reliability and validity, while the structural model evaluates the direct, control and moderating relationships for adaptive capacity and recovery capacity.

Measurement model assessment

Table 4: Internal consistency and convergent validity

Construct	Cronbach's α	AVE	$\sqrt{\text{AVE}}$	Assessment
Adaptive capacity	.763	.646	.804	Acceptable
Competitive intensity	.779	.543	.737	Acceptable
Financial intelligence	.774	.507	.712	Acceptable
Market turbulence	.800	.547	.740	Acceptable
Recovery capacity	.808	.514	.717	Acceptable
Technological turbulence	.741	.595	.771	Acceptable

Note. Cronbach's $\alpha \geq .70$ and AVE $\geq .50$ indicate acceptable internal consistency and convergent validity.

Source: Authors' compilation (2026).

Evidence from Cronbach's alpha ranged from .741 to .808, while AVE ranged from .507 to .646. All constructs therefore met the reported thresholds for internal consistency and convergent validity. The study proceeds to conduct correlation analysis and the result was presented in the Table 5.

Table 5: Latent-variable correlations

Construct	AC	CI	FI	MT	RC	TT
AC	1.000					
CI	.668	1.000				
FI	.641	.586	1.000			
MT	.528	.528	.591	1.000		
RC	.618	.558	.730	.503	1.000	
TT	.417	.477	.459	.504	.490	1.000

Note. AC = adaptive capacity; CI = competitive intensity; FI = financial intelligence; MT = market turbulence; RC = recovery capacity; TT = technological turbulence. Source: Authors' compilation (2026).

The latent-variable correlations were positive and ranged from .417 to .730. All were below .80, indicating that no pair of constructs had an excessively high bivariate association. Correlations alone do not establish the absence of multicollinearity; that issue was assessed separately with the variance inflation factor reported in Table 6.

The Fornell-Larcker criterion was satisfied for most construct pairs. After aligning the diagonal entries with the square roots of AVE reported in Table 3, the financial intelligence–recovery capacity correlation (.729) slightly exceeded the square root of AVE for financial intelligence (.712) and recovery capacity (.717). The criterion therefore indicates some conceptual overlap between these two constructs. Because all HTMT values remained below .90, discriminant validity was supported principally by HTMT, although the closeness of financial intelligence and recovery capacity should be acknowledged when interpreting their relationship.

Table 6: Fornell–Larcker discriminant-validity assessment

Construct	AC	CI	FI	MT	RC	TT
AC	.804					
CI	.667	.737				
FI	.645	.577	.712			
MT	.528	.530	.584	.740		
RC	.632	.572	.729	.513	.717	
TT	.417	.477	.467	.507	.488	.771

Note. Bold diagonal entries are the square roots of AVE; off-diagonal entries are latent-variable correlations. Each diagonal value should exceed the corresponding correlations in its row and column.

Source: Authors' compilation (2026).

Table 7: Heterotrait–monotrait ratio (HTMT)

Construct	AC	CI	FI	MT	RC	TT
AC	—					
CI	.787	—				
FI	.750	.865	—			
MT	.804	.840	.703	—		
RC	.743	.749	.708	.696	—	
TT	.741	.875	.821	.842	.804	—

Note. HTMT values below .90 indicate acceptable discriminant validity under the adopted criterion.

Source: Authors' compilation (2026).

All HTMT values were below .90, ranging from .696 to .875. The highest value was observed between competitive intensity and technological turbulence (.875). Thus, HTMT supports discriminant validity. The study then proceeds to assess the collinearity among the variables. The result was presented in Table 8.

Table 8: Inner collinearity assessment

Predictor	Adaptive capacity	Recovery capacity	Assessment at VIF < 10
Competitive intensity	2.057	2.057	Acceptable
Financial intelligence	1.998	1.998	Acceptable
Market turbulence	2.256	2.256	Acceptable
Technological turbulence	1.938	1.938	Acceptable
FI × competitive intensity	3.703	3.703	Acceptable
FI × technological turbulence	4.073	4.073	Acceptable
FI × market turbulence	5.390	5.390	Acceptable

Note. FI = financial intelligence. VIF values below 10 indicate the absence of severe multicollinearity under the study's adopted threshold. Source: Authors' compilation (2026).

The resilience outcomes VIF values were between 1.938 and 5.390, which are below the accepted threshold of 10. There was no sign of severe collinearity. However, the interaction of FI × market turbulence had the highest VIF and should be carefully taken into account when estimating and interpreting the moderation model. The study then moves to estimate the model using structural equation modelling, and the results are presented in Table 8 and 9 respectively.

PLS path model result

The structural model was estimated in four steps to assess how stable the results were when more variables were added to the model. Model 1 estimated the effects of competitive intensity, market turbulence and technological turbulence. Business period was introduced as the control variable in Model 2. Model 3 added financial intelligence and its relationship with the three turbulence factors, and Model 4 added all the predictors and the control variable. This is because the coefficients reported are standardised, and the values represent the expected change in the outcome, in standard deviations, for a one-standard-deviation change in the predictor.

Table 9: Hierarchical structural model for adaptive capacity

Structural relationship	Model 1	Model 2	Model 3	Model 4
Competitive intensity → AC	0.535 [8.289]***	0.535 [8.235]***	0.345 [5.147]***	0.345 [5.133]***
Market turbulence → AC	0.217 [3.075]***	0.217 [3.067]***	0.170 [2.831]***	0.170 [2.836]***
Technological turbulence → AC	0.053 [0.790]	0.053 [0.782]	0.119 [1.944]	0.118 [1.933]
Financial intelligence → AC	—	—	0.363 [5.351]***	0.363 [5.348]***
FI × Competitive intensity → AC	—	—	-0.111 [1.803]	-0.111 [1.793]
FI × Market turbulence → AC	—	—	0.060 [1.132]	0.060 [1.126]
FI × Technological turbulence → AC	—	—	0.134 [2.559]**	0.134 [2.556]**
Business period → AC	—	0.001 [0.021]	—	0.001 [0.036]
R ²	0.499	0.499	0.596	0.596
Adjusted R ²	0.495	0.493	0.587	0.585
Change in R ²	—	0.000	0.097	0.097
Q ²	NR	NR	NR	0.209
SRMR	0.075	0.070	0.073	0.079
Sample size	326	326	326	326

Note. Entries are standardised path coefficients with bootstrapped t-statistics in brackets. *** p < .01; ** p < .05. NR = not reported. AC = adaptive capacity; FI = financial intelligence.

Source: Authors' compilation (2026).

The two strongest positive predictors of adaptive capacity were competitive intensity ($\beta = .535$, $t = 8.289$, $p < .01$) and market turbulence ($\beta = .217$, $t = 3.075$, $p < .01$), as seen in Model 1. SMEs with more competitive pressure and/or changing customer or market conditions were more likely to make changes to their product, processes and resources. Technological turbulence was positive, but of little significance, meaning that technological change did not consistently enhance adaptation. The three dimensions of turbulence accounted for 49.9% of the variance in adaptive capacity. When business period was added to Model 2, the resulting model had virtually the same coefficients and R². The length of time an SME had been in operation was not significantly related with its adaptive capacity ($\beta = .001$, $t = .021$), indicating that having been in business for a longer period of time was not a direct determinant of the adaptive capacity of SMEs in this sample. The stability of the turbulence coefficients also suggests that the basic relations between the turbulence coefficients were not affected by the age of the business.

Model 3 had an R² of .499, which increased to .596 following the introduction of financial intelligence and the interaction terms into the model. In the complete Model 4, financial intelligence was the strongest predictor ($\beta = .363$, $t = 5.348$, $p < .01$), followed by competitive intensity ($\beta = .345$, $t = 5.133$, $p < .01$) and market turbulence ($\beta = .170$, $t = 2.836$, $p < .01$). Technological turbulence continued to be insignificant as

a direct predictor, and business period continued to be insignificant as well. The complete model thus indicates that adaptation is primarily determined by the financial decision-making capacity of the managers and by the extent of competitive and market responsiveness of firms. The model accounted for 59.6% of adaptive capacity, a 9.7 percentage point increase in the baseline model. This improvement is due to the combined effect of financial intelligence and moderation, with financial intelligence not responsible for the entire improvement.

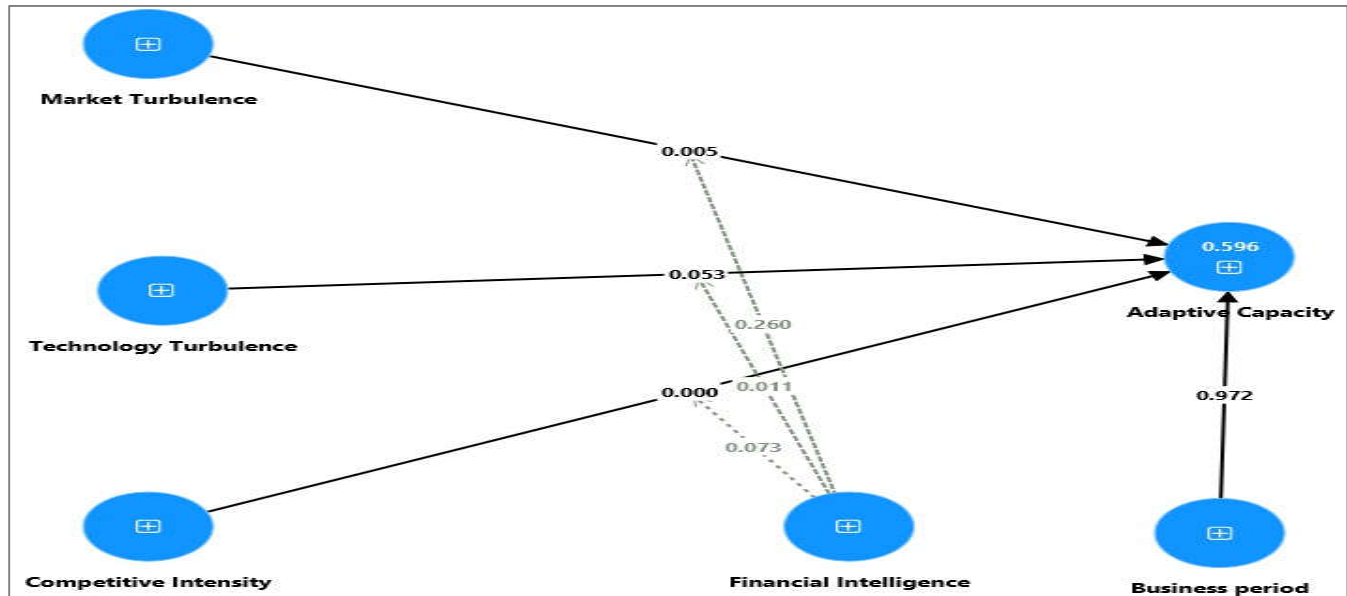


Figure 2: Final structural model for adaptive capacity

Note. The diagram reports the final-model path estimates generated in SmartPLS; Table 9 provides the corresponding bootstrapped test statistics.

In Model 1, competitive intensity ($\beta = .350$, $t = 6.018$, $p < .01$), market turbulence ($\beta = .225$, $t = 3.442$, $p < .01$) and technological turbulence ($\beta = .215$, $t = 3.036$, $p < .01$) all had positive relationships with recovery capacity. The degree of competition was the highest of the three. The data shows that the ability to recover from disruption and restore operations was linked to exposure to competitive, market and technological change. These factors together accounted for 42.0% of the variability in the recovery capacity.

In Model 2, R^2 increased slightly from .420 to .426 after business period was added. Business period was not statistically significant ($\beta = .077$, $t = 1.816$), while the coefficients for competitive intensity, market turbulence and technological turbulence remained close to their Model 1 estimates. Thus, the baseline turbulence-recovery relationships were not materially altered by the age of the business.

With the addition of financial intelligence and the interaction terms, R^2 increased to .586 in Model 3 and to .590 in the full Model 4. Financial intelligence was the strongest positive predictor of recovery capacity in Model 4 ($\beta = .540$, $t = 7.573$, $p < .01$). Competitive intensity ($\beta = .127$, $t = 2.312$, $p < .05$) and technological turbulence ($\beta = .141$, $t = 2.020$, $p < .05$) also remained significant, whereas market turbulence became insignificant ($\beta = .028$, $t = .421$). Business period remained insignificant. The full model therefore explained 59.0% of the variance in recovery capacity, representing a 17.0 percentage-point increase over the 42.0% explained by the baseline model. The result highlights the strong direct association between financial intelligence and SMEs' capacity to restore operations and manage financial pressure, while the moderation effects for recovery capacity were not significant.

Table 10: Hierarchical structural model for recovery capacity

Structural relationship	Model 1	Model 2	Model 3	Model 4
Competitive intensity → RC	0.350 [6.018]***	0.353 [6.085]***	0.124 [2.266]**	0.127 [2.312]**
Market turbulence → RC	0.225 [3.442]***	0.224 [3.458]***	0.026 [0.388]	0.028 [0.421]
Technological turbulence → RC	0.215 [3.036]***	0.210 [3.006]***	0.144 [2.089]**	0.141 [2.020]**
Financial intelligence → RC	—	—	0.542 [7.544]***	0.540 [7.573]***
FI × Competitive intensity → RC	—	—	−0.093 [1.466]	−0.094 [1.487]
FI × Market turbulence → RC	—	—	0.033 [0.622]	0.036 [0.678]
FI × Technological turbulence → RC	—	—	−0.010 [0.178]	−0.010 [0.194]
Business period → RC	—	0.077 [1.816]	—	0.063 [1.635]
R ²	0.420	0.426	0.586	0.590
Adjusted R ²	0.415	0.419	0.577	0.579
Change in R ²	—	0.006	0.166	0.170
Q ²	NR	NR	NR	0.252
SRMR	0.073	0.079	0.079	0.076
Sample size	326	326	326	326

Note. Entries are standardised path coefficients with bootstrapped t-statistics in brackets. *** p < .01; ** p < .05. NR = not reported. RC = recovery capacity; FI = financial intelligence.

Source: Authors' compilation (2026).

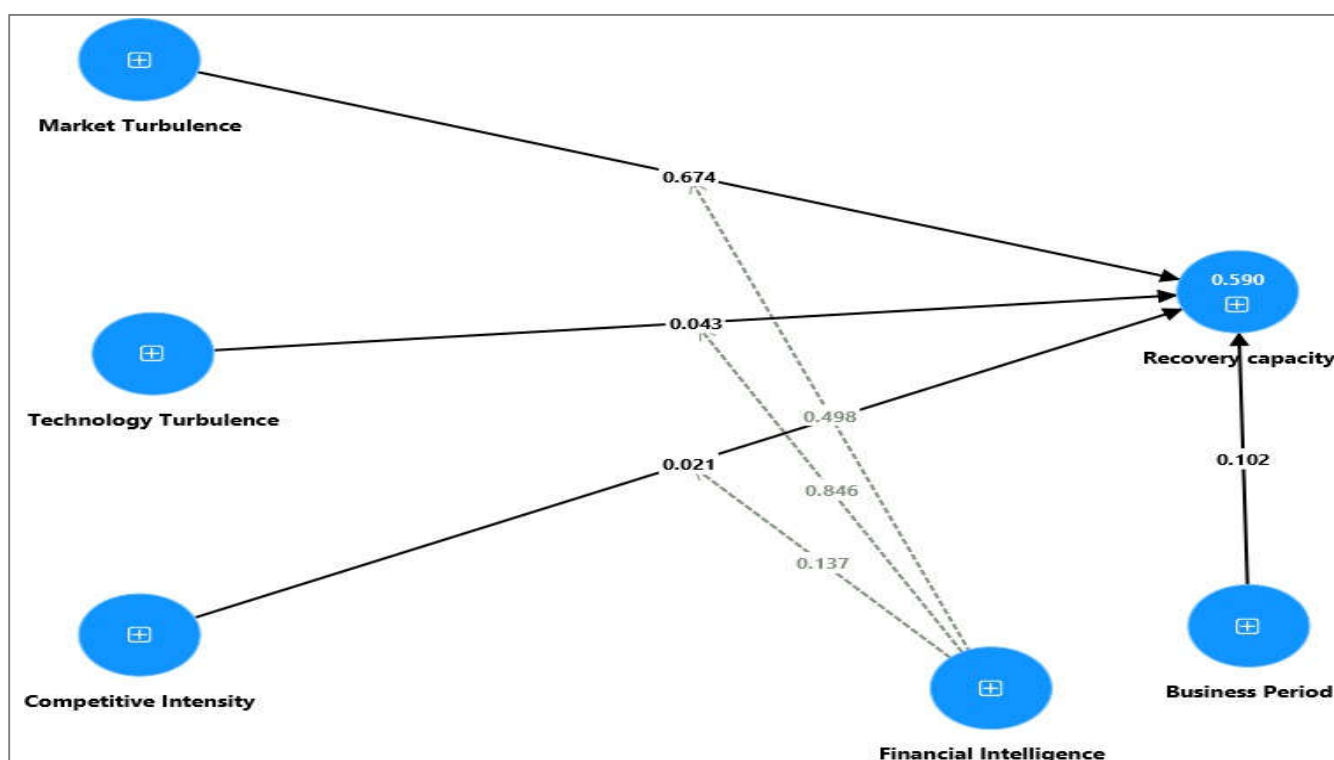


Figure 3: Final structural model for recovery capacity

Note. The diagram reports the final-model path estimates generated in SmartPLS; Table 10 provides the corresponding bootstrapped test statistics.

The full models accounted for 59.6% of the variation for adaptive capacity and 59.0% for recovery capacity. These R^2 values were adjusted by predictors to .585 and .579, respectively, which were not very different from the R^2 values, suggesting that the number of predictors did not inflate the explanatory power of the model. The other 40.4% and 41.0% of the outcomes were related to factors not included in the models.

Adaptive capacity ($Q^2=.209$) and recovery capacity ($Q^2=.252$) values were positive and indicated that the models were predictive of the observed sample. The final-model SRMR values were .079 and .076, respectively, and were below the accepted .08 cutoff value for acceptable approximate fit. Therefore, the values of the R^2 , adjusted R^2 , Q^2 and SRMR suggest that the models account for a large percentage of the resilience of SMEs and that the modeled relationships are captured to a reasonable extent. Given this, the financial intelligence's direct links with the two aspects of SME resilience were strong. The strength of competition was positively associated with adaptive and recovery capacities; market turbulence was positively associated only with adaptive capacity in the full model; and technological turbulence was positively associated only with recovery capacity in the direct influence model. Technological turbulence had a positive impact on adaptive capacity, with financial intelligence reinforcing this relationship, but other moderating relationships were not identified. There was negligible contribution from business period on both outcomes.

Moderation results

Table 11 reports the interaction effects separately. A significant interaction indicates that the relationship between a turbulence dimension and SME resilience changes according to the level of financial intelligence.

Table 11 Moderating role of financial intelligence

Moderating relationship	Outcome	β	t-statistic	p-value	Decision
FI × competitive intensity	Adaptive capacity	-0.111	1.793	0.073	Insignificant
FI × market turbulence	Adaptive capacity	0.060	1.126	0.260	Insignificant
FI × technological turbulence	Adaptive capacity	0.134	2.556	0.011	Significant
FI × competitive intensity	Recovery capacity	-0.094	1.487	0.137	Insignificant
FI × market turbulence	Recovery capacity	0.036	0.678	0.498	Insignificant
FI × technological turbulence	Recovery capacity	-0.010	0.194	0.846	Insignificant

Note. β denotes the standardised interaction coefficient. Decisions are based on the 1% and 5% significance levels. FI = financial intelligence. **Source: Authors' compilation (2026).**

Financial intelligence was a significant interaction with technological turbulence, ($\beta = .134$, $t = 2.556$, $p = .011$.) The positive sign indicates that, stronger financial intelligence makes technological changes into adaptation, in the case of SMEs. The higher the financial intelligence, the more positive the relationship between technological turbulence and adaptive capacity is (as shown in Figure 4), with a weaker positive relationship at the medium level and a slightly negative one at the low level. The financial savvy managers may then be better equipped to assess the cost of technology, allocate money and choose changes that enhance the firm's reaction. Financial intelligence had no significant relations with

competitive intensity and market turbulence for adaptive capacity. The three interactions were also not significant for recovery capacity. Financial intelligence, therefore, should not be considered a general moderator between environmental turbulence and SME resilience, but rather a specific one of the technological turbulence–adaptive capacity relationship. It had a direct impact on recovery capacity: financially intelligent SMEs recovered better, but no significant differences were found between how any of the turbulence dimensions affected recovery when it was measured through financial intelligence. The slope was presented in Figure 4.

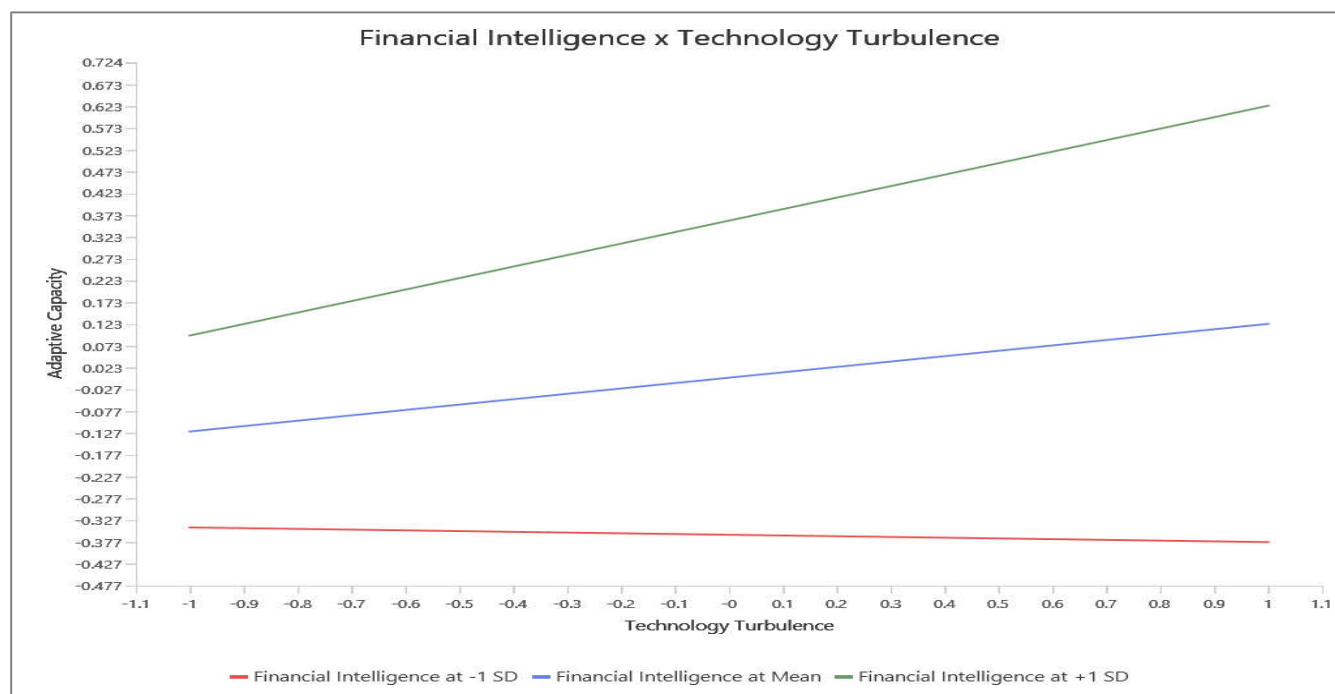


Figure 4: Financial intelligence, technological turbulence and adaptive capacity

Note. Only the statistically significant interaction is plotted in the main text. The graph illustrates direction; the coefficient, t-statistic and p-value provide the formal test.

4.1 Discussion of findings

This result indicates that environmental turbulence does not affect all facets of SME resilience in the same way. The complete model revealed that competitive intensity and market turbulence were positively associated with adaptive capacity, as was competitive intensity and technological turbulence with recovery capacity. Financial intelligence showed the highest direct link with both results and only affected the link between technological turbulence and adaptive capacity. Business period did not provide an explanation for either resilience outcome. These results thus differentiate between a direct value of financial intelligence and its more restricted function as a moderator.

Competitive intensity continued to be a positive predictor for adaptive and recovery capacities. Contrary to the belief that it only brings bad news, competition seems to create incentives for SMEs to rethink products, pricing, processes and resource utilization and to rapidly recoup losses when disruptions are likely to jeopardize their market. This finding aligns with the findings of Poi and Adim (2021), which showed that strategic flexibility among the small and medium scale enterprises in Port Harcourt is related to environmental turbulence. It also encourages the dynamic-capability perspective that external pressure can help to stimulate sensing, decision making, and resource reconfiguration. This does not

imply that competition is always a positive factor; rather it suggests that for this sample, the more SMEs responded to competition, the greater their resilience.

Adaptive capacity was positively predicted by market turbulence, which remained significant in the model regardless of the other model terms. Market turbulence was a positive predictor of adaptive capacity, and remained an independent predictor of adaptive capacity after inclusion of the other model terms. The response of SMEs to such changes in customer preferences and demand may therefore involve changes to their product and service design as well as in the way they operate, but not necessarily fast enough to enable businesses to rebuild critical activities following a disruption. This is in line with the interpretation by St-Jean and Tremblay (2023) which demonstrates how turbulence can force organisation to change and at the same time cause strain on the entrepreneurs. It also further supports the results of Ozanne et al. (2022) and Dejardin et al. (2023) finding that resilience is not just about environmental changes but also depends on the capabilities with which the firm interprets and responds to the changing environment.

Technological turbulence did not have a statistically reliable direct link to any of the model's adaptive capacity components, but it was a positive predictor of recovery capacity in the complete model. While the rapid technological change is likely to produce adaptation, SMEs need to evaluate if a new technology is affordable, suitable and compatible with their current operations. Digital tools, alternative platforms and process technologies, however, may provide some support to restore communications, production and customer service after the disruption. This is in line with Huang et al. (2023), who demonstrate that environmental dynamism is conducive to innovation when it triggers knowledge-based behaviour; and with Li et al. (2024), who highlight technological and financial answers as key elements of enterprise recovery. The current finding extends this finding by showing there is a different direct impact of the technological turbulence on the adjustment and the recovery.

The best predictor of adaptive and recovery capacities was financial intelligence. SMEs with managers who understood the financial data, were able to predict cash flow requirements, assess investment options and prioritize limited resources were more likely to modify operations and rebuild where disrupted. This discovery is in line with Kotsios (2023), who found financial management, planning and risk assessment to be crucial skills of resilience, and also with Alshebami and Murad (2022), who found a positive correlation between sustainable performance and financial literacy. It also builds on Tran et al. (2023) by highlighting that financial reasoning is not just pertinent to entrepreneurial decision making, but is also applicable to the firm's level of resilience. The significant improvement in the explained variance after financial intelligence and the interaction terms entered, however, is due to them as a group and does not necessarily imply that it's due to moderation alone.

Selective moderation was found in the result. The relationship between technological turbulence and adaptive capacity was reinforced when financial intelligence was included, and this is indicated in the simple-slopes plot: there is a more positive relationship between technological turbulence and adaptive capacity as financial intelligence increased in both cases. Better managers are more likely to evaluate technology costs and benefits and more likely to secure funds and select technology that is appropriate to the firm's cash-flow situation. This is consistent with Contingency Theory as value of technological change is partly contingent on the financial capability to manage the change. The other five interaction effects were not significant. Financial intelligence was then found to have significant direct benefits, but such effects of competitive intensity or market turbulence were not generally found to be different, nor were there any changes in the relationships between market turbulence and the recovery of those effects.

This boundary is theoretically meaningful: A capability may have an impact on resilience without affecting all environmental influences.

5. Conclusion

Based on this study, it is concluded that financial intelligence is one of the key capabilities which plays a critical role in the resilience of SMEs in a turbulent business environment, but not in the same way. Increased competitive intensity helped both adaptation and recovery, market turbulence helped adaptation, and technological turbulence helped recovery. Financial intelligence was directly associated with both dimensions of resilience, and enhanced adaptive responses to technological turbulence; it was not seen to moderate the other turbulence-resilience relationships. The financial intelligence should thus be considered as an operational ability and should be integrated into the day-to-day strategies and decisions of SME managers, through budgeting, cash-flow forecasting, pricing analysis, financing assessment and technology appraisal. Access to finance initiatives should be complemented with practical financial-decision training carried out by public enterprise agencies, financial institutions and business associations, particularly in the area of technology investment and disruption planning.

Some limitations of the findings are to be noted. The cross-sectional design reveals associations but doesn't provide evidence of the temporal sequence of the development of resilience or the causal order of events. The results of the study may not be generalizable to SMEs in other parts of Nigeria, or other institutional contexts. Further research should adopt a longitudinal or multi-wave design to clarify the order of turbulence and financial intelligence and resilience. The larger probability samples based on revised business registers ought to contain other Nigerian regions and similar developing economies. Future models could also include firm size, sector, access to finance, digital capability and managerial experience as boundary conditions or controls, test the potential for nonlinear effects of financial turbulence and intelligence, and test out-of-sample prediction using PLSpredict or holdout samples. These extensions would provide indication of the extent to which relationships seen here are consistent over time, across location and across type of SME.

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