Tomas Bata University in Zlín
Faculty of Management and Economics

Doctoral Thesis

# Enhancing Sustainable Innovation through Environmental Orientation: The Role of Dynamic Capabilities and Organisational Resilience in Small and Medium-Sized Enterprises

## Posilování udržitelné inovace prostřednictvím environmentální orientace: Role dynamických schopností a organizační odolnosti v malých a středních podnicích

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# DEDICATION

This work is dedicated to my dearest wife, Yvonne Owusu, mum, Josephine Aninwaah and children, Edmund Konadu Asante, and Melvin Kofi Asante.

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# ABSTRACT

Although sustainable innovation holds strategic importance in addressing the rising global environmental challenges, how environmental orientation supports businesses in improving their sustainable innovation outcomes remains empirically unverified. Generally, environmental scholars' theorisation that a sustainability-oriented strategy may produce sustainable innovation as an add-on benefit still needs to be further and fully validated. This research investigated the relationship between small and medium enterprises' environmental orientation and sustainable innovation outcomes to address this gap. Recognising that the association between environmental orientation and sustainable innovation may not always be direct, the study theorises that dynamic capability (i.e., sensing, seizing and reconfiguration) and organisational resilience (i.e., resilience behaviour, resource and capability) may form part of the boundary conditions that improve environmental orientation and its impact on small and medium enterprises' sustainable innovation. The study adjoins the dynamic capability theory with the conservation of resource theory to test this relationship among small businesses within a developing economy. This study employed symmetrical (i.e., partial least square structural equation modelling) and asymmetrical approaches (i.e., fuzzy set qualitative comparative analysis) to determine the different configurations of conditions that produced better sustainable innovation outcomes. Using a two-wave data set separated by a period of two weeks, the study surveyed a total of 289 owner-managers of SMEs within three cities in Ghana. A total of 24 responses were not included because no response was received during the second wave, and 33 were also not included because of incompleteness. Therefore, 232 was used for the final analysis, giving a response rate of 63%. Findings from the study confute the implicit and explicit propositions that having all the antecedents of dynamic capability concurrently would generate a better firm performance outcome. Specifically, findings from the fsQCA underscore that having sensing, seizing, and configuration concurrently may not always create improved performance outcomes. It may even constrain the existence of sustainable innovation, especially when its presence is not required in a given context. Additionally, findings from the interactive role of organisational resilience in the relationship between environmental orientation and sustainable innovation revealed that, from being a mere correlation, resilience behaviour, resources, and capabilities mediated the relationship between environmental orientation and sustainable innovation. These interaction effects were subsequently identified as partial mediation, as environmental orientation first reported a significant relationship with the endogenous variable (sustainable innovation) and the boundary variables.

# ABSTRAKT

Ačkoli udržitelná inovace má strategický význam pro řešení rostoucích globálních environmentálních výzev, zůstává empiricky neověřeno, jak orientace na environmentální udržitelnost podporuje podniky ve zlepšování jejich výsledků v oblasti udržitelné inovace. Obecně platí, že teorie environmentálních vědců, že strategie orientovaná na udržitelnost může přinést udržitelnou inovaci jako dodatečný přínos, musí být ještě dále a plně ověřena. Aby se tato mezera naplnila, zkoumal tento výzkum vztah mezi orientací malých a středních podniků na environmentální udržitelnost a jejich výsledky v oblasti udržitelné inovace. Vzhledem k tomu, že souvislost mezi orientací na environmentální udržitelnost a udržitelnými inovacemi nemusí být vždy přímá, studie teoreticky předpokládá, že dynamická schopnost (tj. vnímání, využívání a rekonfigurace) a organizační odolnost (tj. odolné chování, zdroje a schopnosti) mohou tvořit součást hraničních podmínek, které zlepšují orientaci na environmentální udržitelnost a její dopad na udržitelné inovace malých a středních podniků. Studie spojuje teorii dynamických schopností s teorií zachování zdrojů, aby otestovala tento vztah mezi malými podniky v rozvíjející se ekonomice. Tato studie použila symetrické (tj. modelování strukturálních rovnic metodou částečných nejmenších čtverců) a asymetrické přístupy (tj. kvalitativní komparativní analýzu fuzzy set) k určení různých konfigurací podmínek, které vedly k lepším výsledkům v oblasti udržitelné inovace. Studie využila data ze dvou vln oddělených dvoutýdenním intervalem a oslovila celkem 289 majitelů a manažerů malých a středních podniků ve třech městech v Ghaně. Celkem 24 odpovědí nebylo zahrnuto, protože během druhé vlny nebyly obdrženy žádné odpovědi, a 33 odpovědí nebylo zahrnuto z důvodu neúplnosti. Pro konečnou analýzu bylo proto použito 232 odpovědí, což představuje míru odezvy 63 %. Závěry studie vyvracejí implicitní a explicitní tvrzení, že souběžné existence všech předchůdců dynamických schopností by ve velké míře vedly k lepším výsledkům firmy. Konkrétně závěry fsQCA zdůrazňují, že souběžná existence vnímání, uchopení a konfigurace nemusí vždy vést ke zlepšení výsledků. Může dokonce omezovat existenci udržitelných inovací, zejména pokud jejich přítomnost není v daném kontextu vyžadována. Kromě toho zjištění z interaktivní role organizační odolnosti v orientaci na environmentální udržitelnost a vztahu k udržitelným inovacím odhalila, že od pouhé korelace odolné chování, zdroje a schopnosti zprostředkovávaly vztah mezi orientací na environmentální udržitelnost a udržitelnými inovacemi. Tyto interakční efekty byly následně identifikovány jako částečné zprostředkování, protože orientace na environmentální udržitelnost nejprve vykázala významný vztah s endogenní proměnnou (udržitelné inovace) a hraničními proměnnými.

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# LIST OF ABBREVIATIONS USED

AVE Average variance extracted

BAF Business Assistance Fund

CFA confirmatory factor analysis

CFI Comparative fit index

CMB Common method bias

Com. Sus Commitment to environmental sustainability

CI Confidence interval

COR Conservative of resource theory

CR Composite reliability

DC Dynamic capability

EO Environmental sustainability orientation

Env. K Environmental knowledge

fsQCA Fuzzy set qualitative comparative analysis

$f^2$ Effect size

GFI Goodness of Fit Index

GRATIS Ghana Appropriate Technology Industry Service

GDP Gross Domestic Product

HTMT Heterotrait-monotrait

LM Linear regression model

MAE Mean absolute error

NBSSI National Board for Small-Scale Industries

NFI Normed fit index

OECD Organisation for Economic Cooperation for Development

OR Organisational resilience

PLS-SEM Structural least square-structural equation modelling

| | |
|---|---|
| QCA | Qualitative comparative analysis |
| $Q^2$ | Predictive relevance |
| $R^2$ | R square |
| REP | Rural Enterprise Project |
| RB | Resilience behaviour |
| RR | Resilience resource |
| RC | Resilience capability |
| RMSE | Root mean square error |
| SEN | Sensing |
| SEZ | Seizing |
| SD | Standard deviation |
| TLI | Tucker Lewis Index |
| Reconf | Reconfiguration |
| SI | Sustainable innovation |
| Sus. P | Sustainable practices |
| VIF | Variance inflation factor |

# 1. INTRODUCTION

## 1.1 Background of the study

The growing environmental challenges worldwide have increased calls for firms to consider new ways to reduce their operational environmental footprint. In the last decade, businesses have come under intense pressure from bodies such as the European Parliament, the African Union, the UK and Canadian governments, and consumer advocacy to adopt eco-conscious business practices (Broccardo et al., 2025). The heightened societal and regulatory pressure is borne out of the expectation that the growing global warming issues cannot be effectively addressed if corporations' modus operandi remains unchanged (Adomako, 2020; Chaudhary et al., 2023). This trend aligns with a broader shift in stakeholder expectations for corporate environmental accountability. As such, environmental orientation (EO)—defined as a firm's commitment to incorporating conservational ideals into its strategy—has emerged as a starting point for much theorising and as a point for investigating businesses' commitment toward a more sustainable future (Banerjee, 2002). The relevance of environmental orientation is heightened by the global commitment to the United Nations' Sustainable Development Goals (SDGs), particularly those targeting climate action and responsible consumption (Rubio-Mozos et al., 2019; Blasi et al., 2021).

To this end, because of the policy expectations of the SDGs, there have been clarion calls for scholars to explore how small and medium enterprises (SMEs) use their environmental orientation to achieve the expected sustainability outcomes because of the contributory role of their activities on industrial emissions (Organisation for Economic Co-operation and Development, 2017; World Bank, 2019). Globally, it is estimated that nearly 60% of all greenhouse gas (GHG) emissions and 70% of world pollution are directly related to the operations of small- and medium-sized enterprises (SMEs) (Parker et al., 2009; European Commission, 2010). Despite SMEs' monumental impact on industrial emissions, they have not been featured prominently in climate action discourse (Kosasih et al., 2023; Olekanma et al., 2024). Only a handful of studies have focused on SMEs and investigated how their strategic orientation achieves the expected Sustainable Development Goals (SDGs), particularly those targeted at fostering responsible production (Siegel et al., 2022; Kosasih et al., 2023).

Further, given the growing public apprehensions over the rise in environmental deterioration and the strict regulation of businesses' operations, enterprises, of which SMEs are not an exception, are now under growing pressure to harmonise their operations in line with ecological principles (Banerjee, 2002; Wang, 2020). Sustainable innovation (SI), which emphasises the development of novel products and technologies to reduce firms' ecological risks and excessive usage of natural resources (Castellacci & Lie, 2017), is now perceived as a crucial

strategic approach to reduce GHG and facilitate the attainment of the SDGs goals (Chang, 2011). Different from traditional innovation, sustainable innovation seeks to lessen environmental risks (Castellacci & Lie, 2017), enhance resource efficiency (Burki & Dahlstrom, 2017), achieve sustainable development goals (Albort-Morant et al., 2018), and consequently makes firms proactive in sustainable development accountability (Arenhardt et al., 2016). Nevertheless, sustainable innovation does not occur in a vacuum. Instead, it requires stringent modification in the organisation's processes from the institutionalisation of a new green culture (Roy & Khastagir, 2016), creating new organisational processes (Chu et al., 2019), earning the goodwill of all stakeholders (Dangelico et al., 2017), and finally operationalising the ecological agenda into routine practices (Ebrahimi & Mirbargkar, 2017). It suggests that a firm's sustainable innovation success may mainly depend on its strategic orientation because the strategy sends the right signals to the operational units (Dumont, Shen, & Deng, 2017). According to Cheng (2020), a firm's failure to institute the appropriate strategic positioning to garner the necessary support for its environmental identity will weaken its drive for sustainable innovation. Accordingly, a firm's strategic orientation, which determines and directs its activities, will provide a solid process to support its sustainable innovation (Guo & Wang, 2022).

## 1.2 Research Problem

Though sustainable innovation holds strategic importance to addressing the rising global environmental challenges (Fussler, 1996; Chang, 2011), how environmental orientation underpins sustainable innovation remains empirically unverified. Generally, environmental scholars' theorisation that a sustainability-oriented strategy may produce sustainable innovation as an add-on benefit still needs to be further and fully validated. Therefore, despite the surge in environmental orientation studies (Adams et al., 2016; Genc & Benedetto, 2019; Cheng, 2020), the literature still has wide knowledge gaps that must be addressed.

First, although SMEs, per their size, make them significant contributors of global industrial emissions (Organisation for Economic Co-operation and Development, 2017; World Bank, 2019), carbon footprint reduction studies have focused predominantly on large-scale businesses (Guerci et al., 2016; Arnedo et al., 2021; Abdelhamied et al., 2023). Only a handful of studies have focused on SMEs and explored how their strategic orientation achieves the expected ecological goals (Siegel et al., 2022; Kosasih et al., 2023). The study context, Ghana, also represents a developing economy with unique market challenges like inflation, institutional voids, and currency instability (George et al., 2016; Ghana Broadcasting Corporation, 2023). These market-dependent factors can affect SMEs' performance and potentially impede their implementation of environmental orientation strategies, making resilience particularly salient in such a market environment.

There is a theoretical and practical need to understand how resilience enables SMEs to actualise their sustainability goals in economies characterised by frequent market interruptions, such as limited institutional infrastructure support, energy crisis, high inflation and exchange rates and poor governance systems (George et al., 2016). Therefore, given the resource-dependency of sustainable innovation (Berrone et al., 2013) and the peculiarities of market conditions in developing economies (George et al., 2016), resilience—the firm's capacity to adapt, learn, and recover from disruption—may serve as a critical firm-level enabler (Carmeli & Markman, 2011). Despite the growing evidence about the impact of resilience on individual and firm outcomes in fields like management and psychology (Conz & Magnani, 2020; Raetze et al., 2021), economics (Lazzaroni & van Bergeijk, 2014), and supply chain management (Iftikhar, Purvis, & Giannoccaro, 2021), our understanding of its role in SMEs, especially in emerging markets, remains underexplored (Zhou et al., 2023). This oversight is particularly problematic as the impact of environmental orientation might be contextual to the idiosyncratic characteristics of the SME's market condition (Bruhn et al., 2023; Chen & Lee, 2023).

Therefore, exploring organisational resilience's interactive role in the relationship between environmental orientation and sustainable innovation could yield vital insights for theory and practice, especially in non-WEIRD (Western, Educated, Industrialised, Rich, and Democratic) economies. Existing research inadequately addresses the link between environmental orientation and sustainable innovation, especially under the influence of organisational resilience. The assumption that environmental orientation may produce sustainable innovation as a complementary benefit overlooks this relationship's complex, context-dependent characteristics. Additionally, current literature tends to simplify organisational resilience as a one-dimensional construct, neglecting its multi-faceted nature comprising behaviours, resources, and capabilities (Brown et al., 2018). Few studies examine these dimensions in tandem or explore their joint impact on sustainable innovation in developing economies.

Further, though some studies have investigated dynamic capability (DC) as the firm-level capability which supports firm strategic orientation and performance outcomes, little is known about how SMEs depend on their dynamic capability to strengthen their sustainable innovation outcomes (Kang et al., 2012; Randhawa et al., 2021). Accordingly, exploring dynamic capability components' roles in SME environmental orientation and sustainable innovation consequences will provide a deeper understanding of which internal capabilities can produce better sustainable innovation outcomes. Additionally, several studies agree on the theoretical distinction between the sub-dimensions of the dynamic capability construct; many have still overlooked the separate influences of each component on firm performance outcomes (Farzaneh et al., 2022). Few studies separately measured the impact of the sub-dimensions of dynamic capability: sensing, seizing, and reconfiguration on the desired outcomes. Investigating the

compendium of all the dynamic capability sub-constructs distinctly provides a fresh insight, which is more beneficial for SMEs to break through the established path dependence with the internal logic of dynamic capability evolution, which is crucial for fostering eco-friendly innovation and sustainable business growth.

Therefore, the study addresses these gaps by testing a theoretical model that explains the effects of environmental orientation on SMEs' sustainable innovation. This relationship is tested through two theoretical paths, one grounded in the conservation of resource theory (COR) (Hobfoll, 1989) and the other in the capability theory (Teece et al., 1997). The study makes four key contributions. First, this study shifts the current scholarly discourse on sustainability orientation and firm performance by redefining sustainability-oriented innovation as a capability-sensitive and resilience-dependent process. The study challenges the taken-for-granted assumption that sustainability orientation directly and uniformly yields positive innovation outcomes (Adams et al., 2016; Chaudhary et al., 2023), introducing organisational resilience and dynamic capability as a critical mediating mechanism. By drawing on the conservation of resource (COR) theory (Hobfoll, 1989) and dynamic capability theory (DC) (Teece et al., 1997) as a lens, the study reconceptualises sustainable innovation as contingent on firms' ability to sense, seize, reconfigure and protect its resource and adapt, learn and recover from operational challenges amid external shocks, especially in resource-constrained environments.

Additionally, the fulcrum of the model is that it integrates studies from the field of psychology and conceptualises organisational resilience as a three-dimensional construct—resilient behaviour, resource, and capabilities—responding to criticisms that prior studies oversimplify resilience (Moran, 2016; Hillmann & Guenther, 2021). This multi-order framework enriches the literature and creates a complete picture for more nuanced theoretical models. Earlier studies have primarily focused on the one-dimensional effect of the construct or have inadequately distinguished between its behaviour, resource, and capabilities components. Therefore, the study's results affirm the distinctives of these components and the impact each has on firm innovation outcomes. Further, recognising the theoretical distinctiveness of dynamic capability as a three-order construct, the study explores the unique impact of each sub-construct, sensing, seizing, and reconfiguration, on environmental orientation and SMEs' sustainable innovation consequences. The study again anchors on the Ghanaian context, contrasting with earlier theoretical exploration studies whose insights into theory extension and improvement were drawn from developed economies. For example, whereas theories of COR (Hobfoll, 1989) and DC (Teece et al., 1997) have been broadly investigated in developed economies, Ghana’s economy, marked by resource constraints and fluctuating market conditions, allows for the investigation of how these theories play out differently contextually. Therefore, the study results ensure that the findings are grounded in the local context and

offer a broader theoretical contribution by pointing out other pathways of SMEs' sustainable innovation consequences under uncertain market conditions.

Also, by utilising two distinct analytical approaches, the partial least square structural equation modelling (Smart-PLS) (Ringle et al., 2024) and the fuzzy set qualitative comparative analysis (Ragin, 2008), the study not only looks at the unidimensional relationship between the predictive and dependent variables but also unravels the multiplicity of pathways through which environmental sustainability orientation, dynamic capability and organisational resilience combine to achieve sustainability innovation. Practically, this study equips SME managers with a diagnostic framework to evaluate and enhance resilience for sustainable innovation. It highlights specific resilience and capability attributes that enable or constrain sustainable development under turbulent conditions, such as those in emerging economies. It also guides policymakers and development agencies in crafting context-appropriate interventions that build resilience capacity and dynamic capability attributes in SMEs—through flexible financing, capacity-building, and innovation support schemes. Finally, by conducting this research in a non-WEIRD context, the study broadens the empirical foundation of sustainability research, offering globally relevant yet locally grounded insights.

### 1.2.1 Research gaps

First, though sustainable innovation holds strategic importance to tackling the increasing global ecological concerns (Fussler, 1996; Chang, 2011), how environmental orientation reinforces sustainable innovation remains empirically untested. Additionally, judging from the size and presence of SMEs within developed and developing economies, they are major contributors to industrial emissions (Organisation for Economic Co-operation and Development, 2017; World Bank, 2019). Nonetheless, ecological protection studies have focused more on large-scale businesses (Guerci et al., 2016; Arnedo et al., 2021; Abdelhamied et al., 2023). Only a handful of studies have focused on SMEs and investigated how their strategic orientation translates into Sustainable Development Goals (SDGs) (Siegel et al., 2022; Kosasih et al., 2023).

Further, considering the resource-dependence of sustainable innovation (Berrone et al., 2013) and the peculiarities of market conditions in developing economies (George et al., 2016), resilience—the firm's capacity to adapt, learn, and recover from disruption—may serve as a critical firm-level enabler (Carmeli & Markman, 2011). Despite the growing evidence about the impact of resilience on individual and firm outcomes in fields like management and psychology (Conz & Magnani, 2020; Raetze et al., 2021), our understanding of its impact on SMEs' performance outcomes remains underexplored (Zhou et al., 2023). Furthermore, the extant literature seems to simplify organisational resilience as a unidimensional construct, ignoring its multi-faceted nature comprising behaviours, resources, and capabilities (Brown et al., 2018). Few studies examine

these dimensions in tandem or explore their joint impact on sustainable innovation in developing economies.

Also, though some studies have investigated dynamic capability (DC) as the firm-level capability which supports firm strategic orientation and performance outcomes, little is known about how SMEs employ their dynamic capability to undergird their sustainable innovation outcomes (Kang et al., 2012; Randhawa et al., 2021). In addition, scholars agree with the theoretical difference between the sub-dimensions of the dynamic capability construct; many have still overlooked the separate effects of each component on firm performance outcomes (Farzaneh et al., 2022). Few studies separately measured the impact of the sub-dimensions of dynamic capability: sensing, seizing, and reconfiguration on the desired outcomes.

## 1.3 Research Questions and Objectives

### 1.3.1 Research questions

The main research question of this study is, "What are the underlying conditions that undergird the impact of environmental orientation on SMEs' sustainable innovation? This question has been expanded into the following sub-questions:

**RQ1:** How does environmental orientation affect SMEs' sustainable innovation?

**RQ2**: How does dynamic capability affect SMEs' sustainable innovation?

**RQ3**: How do organisational resilience attributes affect SMEs' sustainable innovation?

**RQ4**: Is there a mediation effect of sensing on the relationship between environmental orientation and SMEs' sustainable innovation?

**RQ5**: Is there a mediation effect of seizing on the relationship between environmental orientation and SMEs' sustainable innovation?

**RQ6**: Is there a mediation effect of reconfiguration on the relationship between environmental orientation and SMEs' sustainable innovation?

**RQ7**: Is there a mediation effect of resilience behaviour on the relationship between environmental orientation and SMEs' sustainable innovation?

**RQ8**: Is there a mediation effect of resilience resource on the relationship between environmental orientation and SMEs' sustainable innovation?

**RQ9**: Is there a mediation effect of resilience capability on the relationship between environmental orientation and SMEs' sustainable innovation?

**RQ10:** What configurations of dynamic capability and organisational resilience cause the presence and absence of SMEs' sustainable innovation?

### 1.3.2 Research objectives

The main objective of this study was to investigate the boundary conditions that improve the environmental orientation and sustainable innovation relationships among SMEs in a developing economy. This overarching objective has been separated into specific objectives, which are as follows:

**RO1**: To assess the effect of environmental orientation on SMEs' sustainable innovation.

**RO2**: To examine the effect of dynamic capability on SMEs' sustainable innovation.

**RO3**: To investigate the effect of organisational resilience attributes on SMEs' sustainable innovation.

**RO4**: To assess the mediation effect of sensing on the relationship between environmental orientation and SMEs' sustainable innovation.

**RO5**: To assess the mediation effect of seizing on the relationship between environmental orientation and SMEs' sustainable innovation.

**RO6**: To assess the mediation effect of reconfiguration on the relationship between environmental orientation and SMEs' sustainable innovation.

**RO7**: To assess the mediation effect of resilience behaviour on the relationship between environmental orientation and SMEs' sustainable innovation.

**RO8**: To assess the mediation effect of resilience resources on the relationship between environmental orientation and SMEs' sustainable innovation.

**RO9**: To assess the mediation effect of resilience capability on the relationship between environmental orientation and SMEs' sustainable innovation.

**RO10:** To investigate the configurations of dynamic capability and organisational resilience that cause the presence and absence of sustainable innovation for SMEs.

## 1.4 Doctoral thesis outline

This study was organised into seven chapters as follows:

**Chapter 1: Introduction-** This chapter introduces the research topic and provides background, research problems/questions, gaps, and objectives.

**Chapter 2: Literature Review-** The chapter reviews appropriate literature, considering theoretical and empirical, and describes the study concepts, constructs, and variables.

**Chapter 3: Methodology**- The chapter deals with the epistemological position of the investigator, methodology, methods, and data collection techniques for the study. The chapter details how the two analytical approaches (i.e., fsQCA and PLS-SEM) were used to analyse the study data.

**Chapter 4: Environmental orientation Outcomes on SMEs-** This chapter presents and discusses the results of the PLS-SEM output. The chapter provided a complete unidimensional analysis of the hypothesised paths (i.e., from the direct and indirect relationships).

**Chapter 5: Configurational analysis of environmental orientation outcomes on SMEs -**This chapter presents and discusses the configurations that predict the presence and absence of sustainable innovation, in so doing, reconciling the inconclusive findings that have yet to specify the divergence and convergence consequences of firm-level capabilities on environmental orientation outcomes.

**Chapter 6: Discussion and contribution:** This chapter discusses the overall findings of the study, concludes, and highlights the theoretical and practical implications, limitations, and directions for future research.

**Chapter 7: Conclusion and areas for further studies:** This chapter highlighted the study's main findings and the limitations, and points out areas for future studies.

# 2. LITERATURE REVIEW & HYPOTHESES DEVELOPMENT

## 2.1 Conceptual review

This section presents the study's key concepts and consequently brings to bear the contextual meaning and assumption of the concepts in the extant literature. The concepts to be explored under this section include environmental sustainability orientation, organisational resilience, dynamic capability, sustainable innovation, and small- and medium-scale enterprises. Again, the chapter presents the literature review on the proposed relationships and ends with the conceptual model highlighting the expected association between the constructs.

### 2.1.1 Environmental orientation

As the principal ideology for influencing green ideals in business, environmental orientation has long been considered an important concept in the sustainable development literature (Banerjee, 2002). Though different terminologies such as natural environmental orientation (Menguc & Ozanne, 2005), business environmental ethics (Chang, 2011; Waheed et al., 2024), business green culture (Wang & Juo, 2021), and ecological entrepreneurial orientation (Guo & Wang, 2022) have all been used to describe the construct, they all tend to align with the environmental orientation concept proposed by Banerjee (2002). Banerjee (2002) described environmental orientation as business responsibility towards the environment, recognising business activities' impact on the ecosystem and accepting the duty to minimise their environmental impact to the barest minimum. Earlier studies on environmental orientation have emphasised its two distinct dimensions, internal and external sustainability orientation (e.g., Banerjee, 2002; Gabler et al., 2015). Internal sustainability orientation reflects an enterprise's values and ideals on the extent of its commitment towards environmentalism (Banerjee, 2002). It can hereby be considered as the organisation's pro-environmental principles, which are shown in the design of their plan and strategy regarding ecological protection (Baker & Sinkula, 2005).

In contrast, external sustainability orientation constitutes an enterprise's awareness and proactiveness to its external stakeholders' ecological expectations and needs (Banerjee, 2002). It is often evident in the business strategy and plan concerning sustainable development, the duty to humanity and society, and creating a reputable brand identity. However, for this strategy orientation to produce the necessary environmental changes, the internal and external aspects of the sustainability orientations need to be deciphered into firms' strategies and operational routines (Banerjee, 2002). The role of environmental orientation is extensively recognised in the extant literature. From the arguments of Rao and

Holt (2005), environmental orientation can also alter an organisation's way of thinking and influence employee behaviour by making them the crucial agents for altering the organisational process.

Additionally, it strengthens and connects firms' operations related to various pro-environmental products (Banerjee, 2002). Therefore, environmental orientation can be an important resource which allows an organisation to convey its ecological ideals. Nevertheless, several businesses have been identified as 'floundering around, initiating a mass of environmental enterprises without an inclusive vision or strategy (Lubin & Esty, 2010, p. 154).

### 2.1.2 Organisational resilience

The concept of resilience has seen a surge in management and organisation studies in recent years (Conz & Magnani, 2020; Raetze et al., 2021). Notwithstanding the increasing interest in organisational resilience across various fields such as psychology (Oshio et al., 2018), economics (Lazzaroni & van Bergeijk, 2014), business management (Bhamra et al., 2011; Linnenluecke, 2017) and supply chain management (Iftikhar et al., 2021), there is still no commonly accepted definition in the literature (Asadzadeh et al., 2017). For example, Sabatino (2016) described resilience from three distinct viewpoints: from an engineering view, where it constitutes the quick return of a system, impacted by a hostile condition, to its early state of equilibrium; from an ecological standpoint, resilience constitutes the capacity of a system to assimilate an effect without altering its architecture, uniqueness and purposes; and thirdly from an adaptive perspective, resilience create the ecosystem that enables an entity to feel the effect of fluctuations without losing the capability or resource to manage it effectively.

Unlike Sabatino (2016), Brown et al. (2018) described resilience from the perspective of systems, organisations, economics and societies. From Brown et al. (2017), resilience created in multifaceted adaptive arrangements consists of the assimilation and modification to a new operational state; organisational resilience constitutes having structures, resource and capacities to manage difficulty; economic resilience involves the system's capability to deal with damage or harm; and community resilience underscores the design of new adaptation strategies to deal effectively with all stakeholders changing needs. The increasing interest in organisational literature often lies in the relationship between organisational and community resilience (Prayag, 2019). Organisational and community resilience are intertwined (McManus et al., 2008). The behaviour of complex systems can clarify this dyadic relationship between community and organisational resilience. Folke (2006) examined resilience from a social-ecological systems standpoint, signifying that resilience is grounded in, among others, ecosystem dynamics and social networks, such as stakeholder relations.

Additionally, Folke (2006) argues that there are several stability states, where indecision and changeability are essential for survival. Accordingly, systems

should learn to handle revolution endlessly, rather than returning to an earlier equilibrium position. On the other hand, Lee et al. (2013) assert that communities frequently face tragedies and emergencies, demanding organisations' involvement to react to and recover from such difficulties. Therefore, when firms are not prepared to proactively react to change, communities may lack the required response capability in the future.

However, regarding the harmonies between resilience descriptions, there is also a development from "bouncing back" to "doing better than before" (Melián-Alzola et al., 2020). From Manyena et al. (2011), "bounce back" as returning to the original state does not suggest transformation and could give rise to susceptibility and resistance to growth. Therefore, Seville et al. (2008) regard organisational resilience as the ability to endure, and potentially evolve and thrive, especially during a crisis. In the same view, Ruiz-Martin et al. (2018) viewed resilience as achieving unceasing modification to the organisation's difficult circumstances, while being reinforced. Accordingly, resilience is connected to returning to the earlier state of stability and attaining the required level of stability (Matyas & Pelling, 2015). Although there is no common agreement in the literature about how resilience must be defined, the commonality between these descriptions is bouncing back to doing better than before (Melián-Alzola et al., 2020). Therefore, as adapted in this study, organisational resilience is an organisation's ability to maintain functions and stability and recover quickly from adversity by mobilising and accessing the needed resources.

### 2.1.3 Dynamic capability

Dynamic capabilities are considered firm-level competencies that enable a firm to react adequately to changing market environments (Teece et al., 1997; Teece, 2007). The concept 'dynamic' is inherently connected to the abilities that allow a firm to reinvent and readjust its resources and capabilities to the fluctuating business requirements. Therefore, an enterprise aligns with processes of sensing the need to change, seizing the change opportunity, and transforming resource arrangements to realise the expected market-changing requirements (Schoemaker et al., 2018). These capabilities are perceived as fluid due to their ability to enable a firm to identify, seize, reconfigure, integrate, and build new resource configurations in response to market change (Gupta et al., 2024).

In the seminal paper of Eisenhardt and Martin (2000), distinct types of dynamic capabilities, such as strategic decision making, product development, knowledge creation, and alliance formation, were identified. From the arguments of Eisenhardt and Martin (2000), common characteristics or practices may be present across various dynamic capabilities; this does not make them synonymous. Even though their presence has been linked to high firm response to market changes, their presence may not always lead to a sustained competitive advantage (Eisenhardt & Martin, 2000; Barreto, 2010) and may even hurt firm

performance, especially when their presence is not needed in a given context (Zahra et al., 2006). Others, such as Teece (2007), regard dynamic capabilities to be the direct source of firms' competitive advantage, and some also assert that "dynamic capabilities are necessary but not sufficient conditions for competitive advantage (Eisenhardt & Martin, 2000, p. 1106).

Further Teece (2012) argues that dynamic capabilities can be broadly organised into three groups of activities and adjustments: (1) identification, interpretation and evaluation of an opportunity or threat (sensing); (2) deployment of resource to grasp an opportunity or to respond to a threat and to create value from doing so (seizing opportunities or responding to threats); and (3) reconfiguration, integration and renewal of resource and organizational structures as market conditions change (reconfiguring).

### 2.1.4 Sustainable innovation

Conceptually, sustainable innovation creates new eco-friendly products and constitutes business process management (Dominidiato et al., 2023). Unlike traditional innovation, which resides mainly in productivity and cost-effectiveness, sustainable innovation is seen as a multi-faceted concept, integrating environmental and moral principles into strategic decision-making (Dinh et al., 2024). Given the growing public apprehensions over environmental deterioration and the strict regulation of businesses' operations, enterprises are now under increasing pressure to sync their operations in line with ecological principles (Banerjee et al., 2003; Wang, 2020). Sustainable innovation is now perceived as a crucial strategic approach enabling firms to respond progressively to the environmental pressures and attain sustainable development (Chang, 2011). Fussler (1996) describe sustainable innovation as the invention and utilisation of novel products/services or processes to improve ecological performance and to safeguard the natural ecosystem from further deterioration. With time, emerging studies have shown that firms that proactively engage in sustainable innovation attain positive outcomes in areas such as cost and operational efficiency (Woo et al., 2014), improved brand equity and organisational legitimacy (Berrone et al., 2013), and superior competitive advantage (Tang et al., 2018). Therefore, the emphasis of sustainable innovation is to minimise a business's impact on the environment and achieve greater economic benefits, such as lower operational costs and gaining acceptability in new markets, especially among eco-conscious consumers (Dominidiato et al., 2025).

### 2.1.5 Small and medium-scale enterprises in Ghana

Small and medium-scale enterprises remain crucial to the economic growth and employment creation in developed and emerging economies (Organisation for Economic Cooperation for Development (OECD), 2017). Particularly in OECD regions, data indicate that SMEs comprise the largest share (99%) of all

businesses, accounting for nearly 60% of all employment creation and providing 50-60% of all goods and services. Also, SMEs create over 67% of all employment openings in Europe, accounting for close to 57% of value-added goods and services (European Commission, 2018). Equally, in many African countries, SMEs account for a little over 90% of all private enterprises and over 50% of the region's employment and gross domestic product (GDP) (Abor & Quartery, 2010; Price Waterhouse Coopers, 2013). Specifically, in some sub-Saharan African countries, data available suggests that SMEs account for 50% of South Africa GDP and 60% of its employment (Department of Trade and Industry, 2012), 80% and 40% of Kenyan employment and GDP (Mwarari & Ngugi, 2013) and lastly account for 70% of Ghana's GDP and a little over 70% of all its employment openings in the private sector (Muriithi, 2017).

Considering the substantial impact SMEs have on the Ghanaian economy, several institutional bodies such as the National Board for Small-Scale Industries (NBSSI), the Ghana Appropriate Technology Industry Service (GRATIS), the Business Assistance Fund (BAF), the Ghana Investment Fund, and the Rural Enterprise Project (REP) have been created by successive governments to support their growth and market accessibility (Boateng, 2015). Additionally, to ensure that proper support systems are provided to SMEs, especially those in need, there are attempts to have a workable definition for SMEs. Across Europe, the European Union describe SMEs as enterprises that have less than 250 employees, with their turnover over less than €50M or a balance sheet of less than €43M (Crehan, 2020). Similarly, in Ghana, the Ghana Enterprise Agency and the Ghana Statistical Service defined SMEs as businesses that employ at least five individuals and have assets not exceeding 10 million Ghanaian cedis (Ghana Enterprise Agency, 2024).

However, because of the differences in economies and the sector or industry an SME operates in, the number of employees engaged has often been the preferred parameter to define an SME. For instance, a review done by Berisha and Pula (2015) postulated that the benchmark used to differentiate between SMEs across regions often remains the number of employees engaged. In New Zealand, SMEs have fewer than 100 employees; in South Korea and Europe, the employee size should be less than 250; in Canada and the US, SMEs have fewer than 500 (Berisha & Pula, 2015). However, considering the study's emphasis on Ghanaian SMEs, the definition provided by the Ghana Enterprise Agency and the Ghana Statistical Service will be adopted as the working definition.

### 2.1.6 Ghana Economic Outlook

Ghana's gross domestic product (GDP) growth rate slowed from 3.8% in 2022 to 2.9% in 2023, mainly due to the rippling exigencies from the Russian-Ukrainian war, crumbling world financial conditions, and macroeconomic difficulties. Ghana's local economy growth was primarily influenced by the

extractive sector from the supply end and the private expenditure on the demand side. Like many other developing economies in 2023, Ghana's economy slumped, as the inflation rate of 31.5% in 2022 increased to 40.3% in 2023 (Ghana Broadcasting Corporation, 2023). The country's currency, the cedi, recorded an unprecedented depreciation. In 2022 alone, the currency depreciated sharply against all major foreign currencies, losing over 60% of its value. The economic projections within that fiscal year projected its growth rate to slow to 1.5% in 2023 and see a slight improvement to 2.8% in 2024. Therefore, the economy was projected to recover from these downsides and improve its growth rate from 2024 onwards. The high inflation rate of 31.5% recorded in 2022 significantly affected food security and poverty in the country, eroding the buying power of many households (African Economic Outlook, 2024). This affected the living standards of several households, pushing many people below the poverty line and consequently deteriorating poverty and food insecurity. Statistics suggest that close to 850,000 households were pushed below the poverty line because of the high inflation rate. Multidimensional poverty deteriorated marginally, from 46% in 2017 to 46.7% in 2022, because of the economic downturn from the COVID-19 pandemic. The country's unemployment remains high among youth, particularly those between the ages of 15 and 24. The unemployment rate among this age cohort stood at 7.16%, with a higher rate among women (i.e., 36.7%) than men (i.e., 29.3%) (African Economic Outlook, 2024 ).

The country's currency depreciation began to see some significant improvement as it slowed down from 60% in 2022 to 17% in 2023, mainly because of the implementation of some fiscal measures. As a result of the macroeconomic measures such as fiscal consolidation and better revenue outcomes, the fiscal deficit improved from 11.8% of GDP in 2022 to 4.5% in 2023. The public sector debt slightly improved from 92.4% of GDP in 2022 to 84.9% in 2023 (African Economic Outlook, 2024 ). These improvements in the public sector debt were linked to the Domestic Debt Exchange Program implemented in the 2023 fiscal year. Also, the country's current account deficit reduced from 2.1% of GDP in 2022 to 1.7% in 2023 because of the gains received from exports. Further, by the end of 2022, the country's gross international reserves had reduced from $6.3 billion (2.7 months of import cover) to $5.0 billion (2.3 months) in November 2023. Despite these economic challenges, the country's financial sector remained stable with its capital adequacy ratio above 10% of the Bank of Ghana's capital adequacy requirement. The country's inflation is projected to remain outside the Central Bank's bounds of 8±2 at 20.9% in 2024 and 11.1% in 2025. The fiscal deficit is also expected to extend marginally to 4.9% in 2024 before reducing to 4.2% in 2025. The new government, spearheaded by John Dramani Mahama, upholds fiscal consolidation and discipline. The current account deficit is predicted to expand to 1.9% and 2.3% in 2024 and 2025, respectively.

## 2.2 Theoretical review

### 2.2.1 Capability theory (DC)

The capability and resource conservation theories become the study's theoretical lens. The proponents of the capability theory (Eisenhardt & Martin, 2000; Teece et al., 1997) posit that firm performance outcomes dwell on the suitable combinations of resources and capabilities: sensing, learning, integrating, coordinating and reconfiguration (Teece, 2014). Conceptually, the dynamic capability constitutes the institutional behaviours and qualities that comprise sensing and seizing abilities and reconfiguring the firm-level resource infrastructure to preserve value and facilitate dexterity and adaptability (Teece, 2014; Pitelis, 2022). The proponents of the dynamic capability theory draw their theoretical assumption from the resource-based view theory, where the primary source of business competitiveness is viewed to emerge from the organisation-specific resources, abilities, practices, and procedures that are valuable, rare, inimitable, and non-substitutable (Barney, 1991). Apart from the resource-based view, the dynamic capability theory is also anchored on Nelson and Winter's (1982) evolutionary theory, which underscores evolutionary processes and the impact of firm abilities and practices, shared, patterned, and recurring activities (Pitelis & Wagner, 2019). Though the evolutionary positioning posits that repetitive-based abilities in themselves can elucidate the variances in firms' outcomes, the resource-based view considers that a firm's sustained competitiveness dwells mainly on the organisational-specific capabilities that are valuable, rare, inimitable, and non-substitutable, therefore defying them as non-routines. Therefore, the dynamic capability residing on the ideals of Nelson and Winter's (1982) evolutionary theory and the resource-based view theory highlighted the essence of management decision-making, which is beyond the scope of regular routines or abilities (Teece et al., 2021).

From the capability theory arguments, any strategic direction a firm chooses, whether to operate in a new market or terminate its presence in an existing market, needs these capabilities of sensing and seizing of its environment and reconfiguring its internal and external resources (Pitelis, Teece, & Yang, 2024). According to Helfat and Winter (2011), firms without the necessary resources and capabilities may be unable to convert their internal and external resource to support the expectations of their selected market. Accordingly, as the demand for eco-friendly products is generally driven externally by a new regulatory requirement, customer and supplier requests or market entry requirements, SMEs require a capability that will allow them to sense this new market change on time (Claudy et al. 2016). Sensing capability becomes a firm-level attribute that enables them to recognise, understand, and pursue market opportunities (Pavlou & Sawy, 2011).

Also, because sustainable innovation is distinct from conventional innovation, a firm must learn the idiosyncrasies of this new market request. Accordingly, a firm's ability to learn and re-learn about this new requirement is required for sustainable innovation success. From the capability theory argument, a firm requires a learning capability to better streamline the acquisition and assimilation of sustainable knowledge across all organisational units (Zahra & George, 2002). The lack of learning capability will limit a firm's ability to integrate the new insight with the existing knowledge to improve the evolutionary suitability of sustainable innovation to the new business model (Pavlou & Sawy, 2011). The third and fourth dimensions of capability theory, integration and coordination, are crucial to value creation (Teece, 2018). Additionally, as sustainable innovation requirements are often distinct from conventional invention, coordinating capability becomes inevitable as its presence will facilitate the re-organisation of new tasks, resources, and activities into its newly created working capabilities (Eriksson, 2014).

From the dynamic capability theory argument, sustainable innovation success can be accomplished through the organic recipe of three capabilities: identification of market-changing activities (sensing capability), seizing identified opportunities, select a business model that will be responsive to the seized opportunity, develop or channel the necessary resource, and commercialise the product (seizing capability) and reorganising of resource to accomplish these activities (transforming capability) (Helfat & Martin 2015). Accordingly, SMEs must have these capabilities at their disposal to facilitate the utilisation of their environmental sustainable orientation to achieve the needed impact on their sustainable innovation endeavours (Helfat & Martin, 2015; Zhou et al., 2018).

### 2.2.2 Conservation of resource theory (COR)

Conservation of resource (COR) theory helps understand the significance of resilience for a firm's recovery from resource loss and acquiring additional resources for future endeavours (Hobfoll, 1989). Based on the conservation of resource theory, organisational resilience can operate as a firm-level resource and a psychological capital component that empowers workers to deal with workplace stressors and market uncertainties (Anasori et al., 2023). Scholars argue that firms that have nurtured this capability have a realistic perspective of a wide range of opportunities in response to difficulty, possess the cognitive ability to make rational evaluations of each, and will have the courage to place a high premium on the future so to commence on a new path as fitting (Bardoel & Drago, 2021; Zong & Tsaur, 2023). Because resilience can substantially decrease the undesirable consequences of work outcomes (Aguiar-Quintana et al., 2021), it can buffer the adverse psychological anxiety connected with an unsuccessful endeavour (García-Izquierdo, 2018).

In the absence of resilience, firms are most likely to struggle to sustain business stability, especially during interruptions and, in the end, likely to suffer financial loss in terms of back-orders, sales loss, diminished market share, reduced revenue, and shareholder value (Hendricks & Singhal, 2005; Golgeci & Ponomarov, 2015). Aside from the financial losses, businesses without resilient capability also suffer from non-financial losses such as sluggish resource, brand damage, late deliveries, poor customer service, and reduced quality (Kleindorfer & Saad, 2005; Hohenstein et al., 2015). According to Hendricks et al. (2009), during market disruption, enterprises that have built adequate resilience can channel their slack resource, such as extra inventory and may even achieve less adverse impact, thus resulting in better non-financial outcomes (Hendricks et al., 2009). Therefore, nurturing resilience is more imperative than rapid responses for small enterprises to make the best of this new sustainable positioning (Doern, 2021). Resilience becomes essential to SMEs' sustainable innovation outcomes, particularly in economies with higher market uncertainties and poorer institutional support (de Brito et al., 2022).

## 2.3 Hypotheses Development

### 2.3.1 Environmental orientation and sustainable innovation

Roxas et al. (2017) defined environmental orientation as a firm's long-term positioning of incorporating ecological and social principles and practices into its strategic goals and routine activities. Generally, businesses with an environmental orientation ensure that all their activities, from product conception, design, distribution, and usage, protect the ecosystem (Adams et al. 2016). On the other hand, sustainable innovation constitutes a new form of innovation that emphasises creating novel products and technologies that minimise firms' ecological risks and extreme utilisation of resources (Castellacci & Lie, 2017). Distinct from conventional innovation, sustainable innovation seeks to reduce environmental risks (Castellacci & Lie, 2017), boost resource efficiency (Burki & Dahlstrom, 2017), strive to achieve sustainable development goals (Albort-Morant et al., 2018), and consequently makes firms proactive in addressing the global emission concerns (Arenhardt et al., 2016). Nonetheless, sustainable innovation does not occur in a vacuum. Instead, it requires careful modification in a firm’s processes from the institutionalisation of a new green culture (Roy & Khastagir, 2016), nurturing a new work culture (Chu et al., 2019), gaining the buy-ins of all top managers (Dangelico, 2016), and finally operationalising the green agenda into actual practice (Ebrahimi & Mirbargkar, 2017). It suggests that the success of a firm's ecological principles mainly relies on its strategic direction because the strategy communicates the right gestures to the operative units (Dumont et al., 2017). According to Cheng (2020), a firm's failure to create a new strategic orientation to garner the necessary support for its green identity will undermine its motivation for sustainable innovation, particularly among its

workforce. Accordingly, a firm's strategic orientation, which determines and directs its working activities, provides a solid foundation to support its sustainable innovation (Guo & Wang, 2022). Extant literature has demonstrated that firms that adopt environmental orientation as their new strategic position substantially affect their sustainable innovation performance (Roxas et al., 2017; Guo & Wang, 2022). Since sustainable innovation becomes a direct consequence of environmental orientation (Jagani & Hong, 2022), SMEs that guide their business activities with this new strategic direction will significantly expand their sustainable innovation outcomes. To drive the necessary impact on their sustainable innovation initiatives, it is hypothesised that SMEs must first assimilate sustainable strategic orientation into their long-term strategies to signal to employees that the firm is strongly dedicated to supporting ecological thinking and eco-friendly product design (Awan et al., 2019). Therefore, a positive relationship between environmental orientation and SMEs' sustainable innovation initiatives is expected.

*H1: Environmental orientation will have a positive relationship with sustainable innovation*

### 2.3.2 Dynamic capability and sustainable innovation

#### *Sensing and sustainable innovation*

Sensing, the first component of the dynamic capability, is conceptually viewed as assessing, learning, and analysing the market to identify new opportunities (Khan et al., 2020). Sensing may take several forms, from analysing the market to identify the present needs and latent demands, understanding market growth, and measuring suppliers' response and competitors' feedback towards the present and latent market needs (Teece, 2007). Considering the performance ambiguity associated with sustainable innovation, sensing, which enables a firm to spot the immediate and growing needs and demands of the market, may significantly impact the firm's sustainable innovation consequences (Chen & Chang, 2012). Distinct from traditional innovation, sustainable innovation emphasises creating new products and services that can reduce their environmental footprint and enable the user to achieve superior outcomes (Fussler, 1996). Since the emphasis of sustainable innovation is eco-friendly products with high performance efficiency, the firm requires a sensing capability which can enable it to identify the relevant practices and materials that can facilitate the design of products based on eco-design ideals (Chan, Yee, Dai, & Lim, 2016).

Moreover, because every strategic decision emanates from new market developments, it becomes crucial for business managers to build their sensing abilities to spot these new changes much earlier (Teece, 2007). For instance, organisations which do not have sensing capabilities tend to become mostly aware of these new market changes and demands when their competitors have already launched them into the market. Therefore, the effectiveness of a firm's

sustainable innovation will reside in its ability to identify new dynamics and use that insight to develop products that can meet stakeholder needs (Liboni et al., 2023). This suggests that sensing capability needs to be at the core of a firm's implementation of sustainable environmental strategies to facilitate better innovation outcomes (Pacheco et al., 2018). Mousavi et al. (2018) substantiated that firms' sensing capabilities positively contribute to sustainable innovation. A firm's innovation execution success relies on identifying the best solutions that address global societal challenges and meet stakeholder needs (Liboni et al., 2023). As reiterated by Pacheco et al. (2018), sensing capability must be at the core of a firm's strategy to foster better innovation outcomes. Therefore, sensing becomes a sine qua non as it will enable the firm to continuously identify the prevailing market and latent needs, leading to innovation outcomes that respond effectively to the growing ecological challenges (Chen & Chang, 2012).

### *Seizing and sustainable innovation*

Seizing capabilities encompasses activities that highlight the execution of newly identified market opportunities (Khan et al., 2020). It therefore becomes necessary to institute actions and activities to take advantage of the market opportunities identified during the organisational sensing. The underlying tenets of seizing are to select the relevant business value, models and appropriate regimes (Teece et al., 1997). Therefore, seizing capability helps to identify a business that provides value to consumers and acquires value. Seizing is, therefore, described as mobilising internal and external resources and/or competencies to pursue identified opportunities to strengthen a firm's competitive advantage. SMEs that can sense regulatory changes in the future and create proactive sustainability strategies and policies rather than waiting for the change to transpire before reacting appear to be well-equipped to benefit from improved long-term financial performance and reputation (Roxas et al., 2017; Nguyen & Adomako, 2021). Generally, SMEs with such a proactive approach can shape the market perception positively because they can launch products into the market quite early, enabling them to reap a considerable market share from rivals who may not be able to pursue the identified opportunities (Hamann et al., 2017; Nguyen & Adomako, 2021). According to Lütjen et al. (2019), the impact of seizing capability on firms' innovation outcomes cannot be lowballed because, through its seizing, a firm can respond positively to environmental changes by pursuing the newly identified market opportunities. Mousavi et al. (2018) revealed that enterprises with suitable seizing abilities can aggressively pursue market-changing needs, improving their innovation outcomes. On this basis, the seizing capability of SMEs will have a greater impact on their sustainable innovation outcomes.

### *Reconfiguration and sustainable innovation*

Reconfiguring constitutes modifying an organisation's resource base to make it relevant, valuable, rare, inimitable and non-substitutable (Teece, 2014). By reconfiguring an existing architecture, a firm will deploy and coordinate its resources across the newly created unit (Eriksson, 2014). Organisations that score high on reconfiguration capability may often report significant success in operational devolution, have varied technological substitutes, encourage loose institutional structure and semi-persistent resource architecture, efficient knowledge transfer and incorporation of knowledge from diverse stakeholders. Therefore, reconfiguration fosters the renewal of sensing and seizing and, by far, makes it highly connected with sensing and seizing capabilities (Pitelis et al., 2024). Further, whereas all three dimensions of dynamic capability are crucial to firm performance outcomes, reconfiguration becomes the consequence of sensing and seizing, making it a derivative capability (Pitelis et al., 2024). This presupposes that sensing and seizing must happen before reconfiguration can be properly created and utilised. Pitelis (2022) postulated that the derivative nature of reconfiguration becomes the core of strategy implementation.

Another key attribute of reconfiguration is its coordination capability, which facilitates organisational access and allocation to resources at lower cost and eases firms' responses to market changes (Huang et al., 2012), producing superior performance outcomes (Miller & Shamsie, 1996). Unlike large firms, most SMEs may not possess the same amount of slack resources, making their capability to efficiently coordinate resources and be flexible during market changes quintessential to their sustained competitiveness. For example, SMEs that have adequately built their reconfiguration capability tend to effectively and efficiently allocate people and resources across their organisation (Palmié et al., 2016). Sustainable innovation is not static; therefore, a firm with a traditional identity must adapt or reconfigure existing infrastructure to achieve expected outcomes from its sustainable innovation endeavours (Helfat et al., 2007; Pitelis, 2022). Since firms' sustained performance and competitive advantage depend on their resource architecture adjustment (Helfat et al., 2007; Pitelis, 2022), reconfiguration is expected to affect SMEs' sustainable innovation positively.

## 2.3.3 The mediating role of dynamic capability

Even though the proponents of the capability theory (Eisenhardt & Martin, 2000; Teece et al., 1997) have made a theoretical distinction between the sub-dimensions of the dynamic capability construct, many have still overlooked the separate effects of each sub-component on desired outcomes (Farzaneh et al., 2022). Few studies separately measured the impact of the sub-dimensions of dynamic capability: sensing, seizing, and reconfiguration. Considering that these dimensions may not always produce the expected effect (Eisenhardt & Martin, 2000; Barreto, 2010) and may even hurt firm performance, especially when their

presence are not needed in given time (Zahra et al., 2006), the study sought out to assess the mediating effect of dynamic capability from a three-order construct: sensing, seizing and reconfiguration. The mediating effect of sensing, seizing and reconfiguration in environmental sustainability and SMEs' sustainable relationship is presented below.

### *The mediating role of sensing*

The central aspect of firm sustainable innovation outcomes lies within the proper build-up of green information knowledge (Castellacci & Natera, 2013). Since sustainable innovations are distinct from conventional innovation, their conception and development differ significantly, leading to a large amount of irregular eco-information, which a firm needs to build adequate capacity to identify relevant information and knowledge in the market. Therefore, it becomes crucial to develop a sensing capability that allows an enterprise to effectively identify, extract and seize sufficient information in the complex data world (Zhou & Li, 2012).

Through a sequence of whole closed-loop operations such as collection and extraction, analysis and assessment of internal and external information, businesses can break the "data silos" and normalize the unfiltered data from external competitive product markets, innovation organization platforms (Lu et al., 2021) and internal processes, in that way building a depending information generating and sourcing capability (Bloom et al., 2014). Sensing mainly involves scanning, learning, and analysing the market to discover new opportunities (Khan et al., 2020). An enterprise's sensing activities often involve analysing the market to the needs and latent demands, understanding market growth, and assessing suppliers' response and competitors' feedback (Teece, 2007). Since business activities must revolve with market trends, it becomes important for businesses to build their sensing capability to rigorously explore new (or emerging) developments in local and foreign markets (Teece, 2007). Firms that fail to build their sensing capabilities tend to lose out significantly on market trends and changes. For instance, Siemens Healthineers represents a clear case in which dynamic capabilities obstructed the firm's reaction to evolving digital healthcare trends. According to Teece et al. (2024), notwithstanding being a leading player in the medical technology market, Siemens Healthineers failed to sense the ever-changing industry landscape and seize the opportunity to innovate in the digital healthcare sector, eventually restricting its success in navigating the rising market fluctuations (Teece et al., 2024). Therefore, a firm's environmental sustainability orientation's success will depend on identifying the best innovative solutions that address global societal challenges and meet stakeholder needs (Liboni et al., 2023). This suggests that sensing capability needs to be at the centre of a firm's environmental orientation to foster better innovation outcomes (Pacheco et al., 2018). Therefore, it is proposed that sensing capability will mediate the

relationship between environmental orientation and SMEs' sustainable innovation.

*H2: Sensing will positively mediate the relationship between environmental orientation and sustainable innovation*

***The mediating role of seizing***

Seizing capabilities comprises a compendium of activities that underscore the implementation of newly identified market opportunities (Khan et al., 2020). Seizing is, therefore, described as mobilising internal and external resources and/or competencies to pursue identified opportunities to strengthen a firm's competitive advantage. Results from the study of Mousavi et al. (2018) revealed that enterprises with suitable seizing abilities can aggressively pursue market-changing needs, improving their innovation outcomes. As Teece (2007) rightly put it, the managerial competence needed for sensing and seizing differs. For instance, although a firm might have succeeded in recognising a new market opportunity, it can still fail to seize it. To effectively take hold of a market opportunity, enterprises should be able to: (i) make sound investment decisions, (ii) choose or create suitable (new) business models, (iii) expand technological capabilities, and (iv) sustain their resources (Teece, 2007).

SMEs that can sense regulatory changes in the future and create proactive sustainability strategies and policies rather than waiting for the change to transpire before reacting appear to be well-equipped to benefit from improved long-term financial performance and reputation (Roxas et al., 2017; Nguyen & Adomako, 2021). Generally, SMEs with such proactive capability benefit from the market much earlier because they positively influence consumers' perception of their products and practices and reap a considerable market share from rivals who cannot anticipate such changes (Hamann et al., 2017; Nguyen & Adomako, 2021). Several studies have shown that firms that fail to build adequate seizing capabilities oftentimes do not see better outcomes from their innovation activities primarily because they do not possess the in-house competencies to execute the market insight identified from the market (Khattab, 2017; Farzaneh et al., 2022). Soto-Acosta et al. (2018) reiterated that the capability of a firm to see many returns from its innovation activities relies not only on the development of several internal abilities, such as information technology and knowledge management, but also on the quick response to market changes that occur through technological changes, differences and expansion in customer preferences, or changes in product demand. Seizing capability is anticipated to mediate the relationship between environmental sustainability and SMEs' sustainable innovation.

*H3: Seizing will positively mediate the relationship between environmental orientation and sustainable innovation*

### *The mediating role of reconfiguration*

Reconfiguring capabilities can be referred to as the capability of an enterprise to rejoin its resources and/or re-adapt new resources to achieve the full potential of the identified market opportunities (Teece et al., 1997; Khan et al., 2020). Reconfiguring capabilities is mainly reinforced in the firm's regular routines. These operational organisational practices revitalise and orchestrate resources and competencies to propel the necessary growth (Teece, 2007). Without reconfiguring the old and new resources, an enterprise may have limited capacity to utilise the identified market opportunities adequately.

Because of the intricacy of ecological issues, businesses aiming to respond to market and industry requests must build an effective relationship with a wide range of external actors (i.e., suppliers, customers, state agencies and manufacturers) (Dangelico et al., 2017). However, such coordination can be built appropriately when the existing structure can effectively recognise and make sense of this new market development. Similarly, since the SMEs' existing structures may not support a comprehensive consultation and collaboration, SMEs must build new knowledge and competencies and reconfigure their existing resource to support such exchanges (Dangelico et al., 2017; Cristofaro et al., 2025). Failing to transform the existing resources and systems to accommodate this new strategy will limit a firm's sustainable innovation outcome (Becker & Dietz, 2004). Per the complexity of sustainable innovation and SMEs' resource constraints, the impact of environmental orientation on SMEs' sustainable innovation outcomes will be better explained when the proper institutional capabilities are created and fostered. Therefore, the high presence of reconfiguration is expected to transform and reorganise internal and external resources to produce effective, sustainable innovation outcomes (Helfat & Winter, 2011). It is therefore theorised that reconfiguration capability will mediate the relationship between environmental orientation and SMEs' sustainable innovation.

*H4: Reconfiguration will positively mediate the relationship between environmental orientation and sustainable innovation*

## 2.3.4 Organisational resilience and sustainable innovation

### *Resilience behaviour and sustainable innovation*

Generally, how a firm reacts to market interruptions is primarily linked to a specific behaviour that indicates the firm's level of resilience. Organisations with adequate resilient behaviour appear to be more dependable in responding favourably and competently in the face of uncertainty, which is crucial for enterprise existence and future success (Wang, Cooke, & Huang, 2014). Comparatively resilient behaviour helps organisations to succeed rather than survive. Firms that exhibit this behaviour are more likely to recuperate and learn from difficulty and uncertainty than less resilient organisations (Luthans et al.,

2006). Increasingly, resilience as a behaviour has become essential, especially for people who perform unrelated jobs and businesses engaged in a more fluid or uncertain industry (Luthans et al., 2006).

Resilient behaviour becomes a communicative attitude within the group and influences how individuals respond to market volatility or business failures (Ishak & Williams, 2018). This comprises accepting uncertainty and reality (McCann, 2009) and conquering denial (Hamel & Välikangas, 2003). It has, therefore, been connected to a firm's capability to make meaning during difficult moments–to recognise the positive aspect of a happening and still see the light at the end of the tunnel (Coutu, 2002). Often organisations with resilient behaviour tend to have a strong sense of purpose and identity (McCann, 2009; Ishak & Williams, 2018) and can recognise the opportunities emerging from the situation (Kantur & ˙Iseri-Say, 2012). According to Välikangas (2007), organisations with strong resilient behaviour are usually not distracted by some negative feedback and restore confidence even in times of recurrent discouragement. Ismail et al. (2011) argued that an enterprise with resilient behaviour can still grow and capitalise upon market changes while concurrently responding adequately to its present market demands.

Although sustainable innovation has the potential to reduce a firm's environmental footprint, many firms still struggle with the complexities of embedding it into their business models (Edu et al. 2025). Unlike conventional innovation, which primarily emphasises productivity and product cost, sustainability-oriented innovation is multidimensional and seeks to integrate environmentally friendly and ethical principles into its long-term business goals (Dinh et al. 2024). Clearly, because of its multiplicity of goals and the high level of uncertainty connected with its success, resilience becomes crucial to foster firms' continued engagement in eco-innovation products (Leyva-de la Hiz, Ferron-Vilchez, & Aragon-Correa, 2019). In the absence of resilience behaviour, firms are most likely to struggle to continue with their sustainable innovation ideas during disruptions, and are, in the end, likely to terminate their engagement as a way to save costs (Hendricks & Singhal, 2005; Golgeci & Ponomarov, 2015). On this note, resilience behaviour will significantly influence SMEs' sustainable innovation.

### *Resilience resource and sustainable innovation*

Resilience resources represent the internal and external organisational skills, resources and operational capabilities that allow a business to align its activities to the changing market space (Limnios, Mazzarol, Ghadouani, & Schilizzi, 2014). Quite often, they also reflect organisational habits (Obstfeld, 2012), which focus on continuously performing activities in response to a particular internal or external disruption (Zollo & Winter, 2002). Because they become organisational practices, they significantly impact firms' recovery, particularly during market

interruptions (Chen, Pan, & Ouyang, 2014). In addition, a firm's resilience resource helps improve its business goals and use its operations insights proactively to respond to market dynamics and minimise volatility (Vastag, 2000). Therefore, businesses should recognise resilience as a resource competence acquired through learning and development and unceasing adaptation to several interruptions (Belhadi et al., 2021). In other words, resilience resources can help an organisation to reduce the impact or likelihood of market disruptions (Cheng & Lu, 2017) and consequently strengthen its vigilance, readiness and preparedness for future disruptions (Birkie, Trucco & Campos, 2017). Therefore, during market challenges, enterprises that have built adequate resilience resources can channel their resource, such as extra inventory and may even achieve less adverse impact, thus resulting in better non-financial outcomes (Hendricks, Singhal, & Zhang, 2009). This is because organisations with resilient resources maintain a nuanced picture of ongoing operations, allowing them to channel their assets into more targeted and timely investments in tools or actions that can defuse emerging vulnerabilities and risks before the harm becomes apparent. When likened to conventional innovation, sustainable innovation tends to depend more on resilient resources because it demands substantial capital investment even though success is not always guaranteed (Berrone et al., 2013). Accordingly, resilience resources are expected to influence SMEs' sustainable innovation significantly.

***Resilience capability and sustainable innovation***

As rightly highlighted by Leuridan and Demil (2022), the generation and development of novel products and services do not come without a cost: hurdles, failures, and difficulties are inherent and must be handled appropriately and overcome. However, a firm's ability to effectively manage these costs within its innovation processes depends on its resilience capability. Anchoring on the capability-based theory proposition, resilient capabilities constitute the firm-context experiences demonstrated through the organisation's strength (Wernerfelt, 1984), making imitation difficult and valuable to the firm's coping mechanism with disruptions. Resilience as a capability becomes apparent when the organisation can transform it into actionable activities (Richtnér & Löfsten, 2014). Because sustainable innovation practices may face unexpected difficulties and challenges, resilience could allow the firm to institute routine activities to reduce the difficulties hindering the innovation development process. Again, as the challenges of sustainable innovation may emanate from internal or external processes, a strong resilience capability becomes crucial, especially when the innovation crisis tends to be endogenous in nature (Kim & Yoon, 2015). Results from the study of Kim et al. (2018) observed that resilience constituted an important psychological resource that improved service innovation behaviour and reinforced employee proactiveness to industry changes.

Additionally, because resilience capability seeks to make the possibility of rebounding or bouncing back from difficulties a repetitive behaviour, it eases information and resource sharing among colleagues, managers, and supervisors, which in effect strengthens the organisation's recovery from crises or difficulties (Xie et al., 2023). Therefore, in the advent of disruption, resilience capability can allow an organisation to demonstrate calm judgment and greater confidence in the complexities connected with sustainable innovation (Dai et al., 2019). Empirical results demonstrate that resilience capability strengthens firm recovery from performance difficulties (Dai et al., 2019; Saad & Elshaer, 2020). Therefore, on this basis, resilience capability is hypothesised to influence SMEs' sustainable innovation positively.

### 2.3.5 The mediating role of organisational resilience

As mentioned earlier, although scholars agree on the multi-dimensionality of the organisational resilience concept (Moran, 2016; Linnenluecke, 2017; Hillmann et al., 2021), some studies measured the construct as a single-level concept (e.g., Ray et al., 2011; Ortiz-de-Mandojana & Bansal, 2016; Parker & Ameen, 2018). However, since these dimensions collectively build organisational resilience, it is always necessary to measure the resilience effect multi-dimensionally rather than as a unidimensional construct (Hillmann & Guenther, 2021). Considering that most studies measured organisational resilience unidimensionally, we have a limited understanding of the formative impact of the interrelated attributes or dimensions on organisational outcomes (e.g., Ray et al., 2011; Ortiz-de-Mandojana & Bansal, 2016; Parker & Ameen, 2018). Moving away from the norm, the study assessed the mediating effect of resilience from a three-order construct: resilient behaviour, resource, and capabilities. Consequently, we investigated the relationship of these dimensions to SMEs' sustainable innovation outcomes. The mediating effect of resilient behaviour, resource, and capability is presented below.

#### *The mediating role of resilient behaviour*

Considering the substantial financial and human resource commitments associated with sustainable innovations, organisations may have to modify and redefine their existing innovation processes to respond better to this environmental requirement (Linnenluecke, 2017). Often, sustainable innovation is different from traditional innovation because of its goal to integrate environmental and ethical principles into its innovation ideals and processes (Dinh et al. 2024). Not every firm can maintain innovation functioning and structure with this new eco-friendly-oriented goal (Vogus & Sutcliffe, 2007). For instance, some firms will likely terminate their operations due to the failures and market resistance that may come with the new product design. However, others with resilient attributes will survive, thrive, and become more composed to deal

with the future hurdles of these innovation uncertainties. The differences in firms' reactions to innovation outcomes will be mainly connected to their resilient behaviour (Carmeli & Markman, 2011). Sutcliffe and Vogus (2003) argued that firms with resilient behaviour could quickly process feedback from their process failures and rearrange or transfer the knowledge and resources garnered to deal with future situations.

Therefore, drawing on the COR theory, resilience is crucial for a firm's response to new market changes and its process failures (Hobfoll, 1989). Resilient behaviour, which is described as a communicative mentality within the group (Ishak & Williams, 2018), allows an entity to accept uncertainty and reality (McCann, 2009) and conquer the denial associated with their operational processes (Hamel & Välikangas, 2003). Resilient behaviour is therefore connected to a firm capability to make meaning during difficult moments–to recognise the positive aspect of a happening and still see the light at the end of the tunnel (Coutu, 2002). Empirically, firms with resilient behaviour tend to have a strong sense of purpose and identity (McCann, 2009; Ishak & Williams, 2018) and recognise the opportunities emerging from the situation (Kantur & ˙Iseri-Say, 2012). According to Välikangas (2007), a firm that has built adequate resilient behaviour is often not disturbed by negative feedback and can quickly restore confidence even during recurrent discouragement or failures. Considering that a firm with resilient behaviour can still grow and capitalise upon market changes (Ismail et al., 2011), it is anticipated that small businesses with such behaviour may not lose their drive for sustainable innovation pursuits, particularly when the outcomes of their product do not meet the current market's environmental needs. Therefore, it is hypothesised that resilient behaviour will mediate the relationship between environmental orientation and sustainability.

*H5: Resilience behaviour will positively mediate the relationship between environmental orientation and sustainable innovation*

### *The mediating role of resilient resources*

Resilience resources constitute the internal and external organisational skills, resources and functional competencies that enable an enterprise to match its activities to the business-changing environment (Limnios et al., 2014). Woods (2019) argued that although maintaining an adequate margin of resources is crucial to a firm's response to market disruptions, the real impact depends on how well these resources are channelled in times of distress. For instance, a study done by Gittell et al. (2006) on the United States airline industry after the terrorist attacks on September 11, 2001, observed that airlines with large cash reserves that decided to lay off staff as a reactive measure weakened their relational resource and were less able to bounce back into operation. It was again established that airlines that laid off employees also weakened their ability to respond to subsequent disruptions and provide better innovative services (Gittell

et al., 2006). All this suggests that though the level of resilience resources a firm possesses during market disruption is crucial, its ability not to be consumed by the market flames and pressures depends mainly on how its resources are channelled and utilised. Since resilient organisations are likely to be more efficient in channelling their financial, cognitive, and relational resource in response to emergent and manifest disruptions, it is expected that resilient SMEs will take the lead in deploying rather than restricting the distribution of resources towards their sustainable innovation activities (Staw et al., 1981). Therefore, sustainable innovation will depend more on firm-level resources because of its investment requirements and uncertainty of success (Berrone et al., 2013), so resilient resources become inevitable in the relationship between environmental orientation and sustainable innovation. On this fore, it is hypothesised that resilient resources mediate the relationship between environmental orientation and sustainable innovation.

*H6: Resilience resource will positively mediate the relationship between environmental orientation and sustainable innovation*

***The mediating role of resilient capability***

According to Richtnér and Löfsten (2014, p. 138), 'having a capability means having both ability and capacity, and it is only when a capacity for resilience is transformed into action in an organisation that resilience becomes an organisational capability'. Therefore, resilient capabilities become firm-specific antecedents manifested in the organisation's strength and routines and essentially become valuable to the firm's coping mechanism during disruptions (Wernerfelt, 1984). Resilient capability is reflected in organisational habits (Obstfeld, 2012), which focuses on continuously performing activities in response to particular internal or external market changes (Zollo & Winter, 2002). As a result, during any change, be it strategy or market, these organisational routines may play a significant role in reorganising the distribution routine to deal with the uncertainty of this new operational requirement (Chen et al., 2014). Accordingly, as an SME seeks to integrate sustainability principles into its innovation management, it must adjust its existing processes by reorganising its routines and implementing new governance mechanisms (Keränen et al., 2023). Because of the need for an SME to re-adjust its existing routines and governance system and the high level of uncertainty associated with this new adaptation, a resilient capability becomes a precondition to foster firms' continued engagement in their sustainable innovation reorganisation process (Leyva-de la Hiz et al., 2019; Tariq et al., 2023). Similarly, resilient capability is expected to mediate the relationship between environmental orientation and sustainable innovation.

*H7: Resilience capability will positively mediate the relationship between environmental orientation and sustainable innovation*

## 2.4 Different configurations and sustainable innovation

Considering the contextual differences between economies, SMEs working in emerging economies will likely be entangled in several market distractions. This suggests that the expected relationship between environmental orientation and sustainable innovation may not always assume linear outcomes. However, earlier studies around sustainability and innovation often grounded their analyses on symmetric tests and regression-based models (RBM), such as multiple regression analysis (MRA) and structural equation modelling (SEM). The usual characteristics of symmetric methods are that they account for the direct impact of the explanatory variable on the dependent variable, ignoring the complexities of the relationship among variables in producing an outcome (Pappas et al., 2016). However, focusing mainly on symmetric and net effects may not produce the whole truth, because the observed net effects do not apply to all cases in a dataset, especially among SMEs (Woodside, 2014). For instance, results from the study of Zahra et al. (2006) showed that having all the antecedents of dynamic capability may not always produce the expected outcomes, particularly when an antecedent's presence is not required at the given time. Barreto (2010) corroborated Zahra et al.'s (2006) results by revealing that though dynamic capability presence has been linked to high firm response to market changes, their presence may not always lead to a sustained competitive advantage and may even hurt firm performance, especially when their presence is not needed in a given context (Zahra et al., 2006). Earlier, scholars' proposition that the presence of all the components of dynamic capability is required to strengthen firm performance outcomes needs to be empirically verified in a configurational analysis. Therefore, analysing the predictors of SMEs' sustainable innovation from a configurational approach will challenge the implicit assumption that nurturing all the antecedents of dynamic capability and organisational resilience are always needed to concurrently produce better firm performance outcomes (Eisenhardt & Martin, 2000; Barreto, 2010). On this note, it is expected that predictors of SMEs' sustainable innovation will emerge from different configurations and not from a symmetrical outcome.

*H8: Different configurations will produce SMEs' sustainable innovation*

## 2.5 Conceptual framework

Guided by the research objectives and literature reviewed, the study suggests a conceptual model (see Figure 2.1) to display the expected path relationships between the study variables, environmental orientation, sustainable innovation, dynamic capability, and organisational resilience.

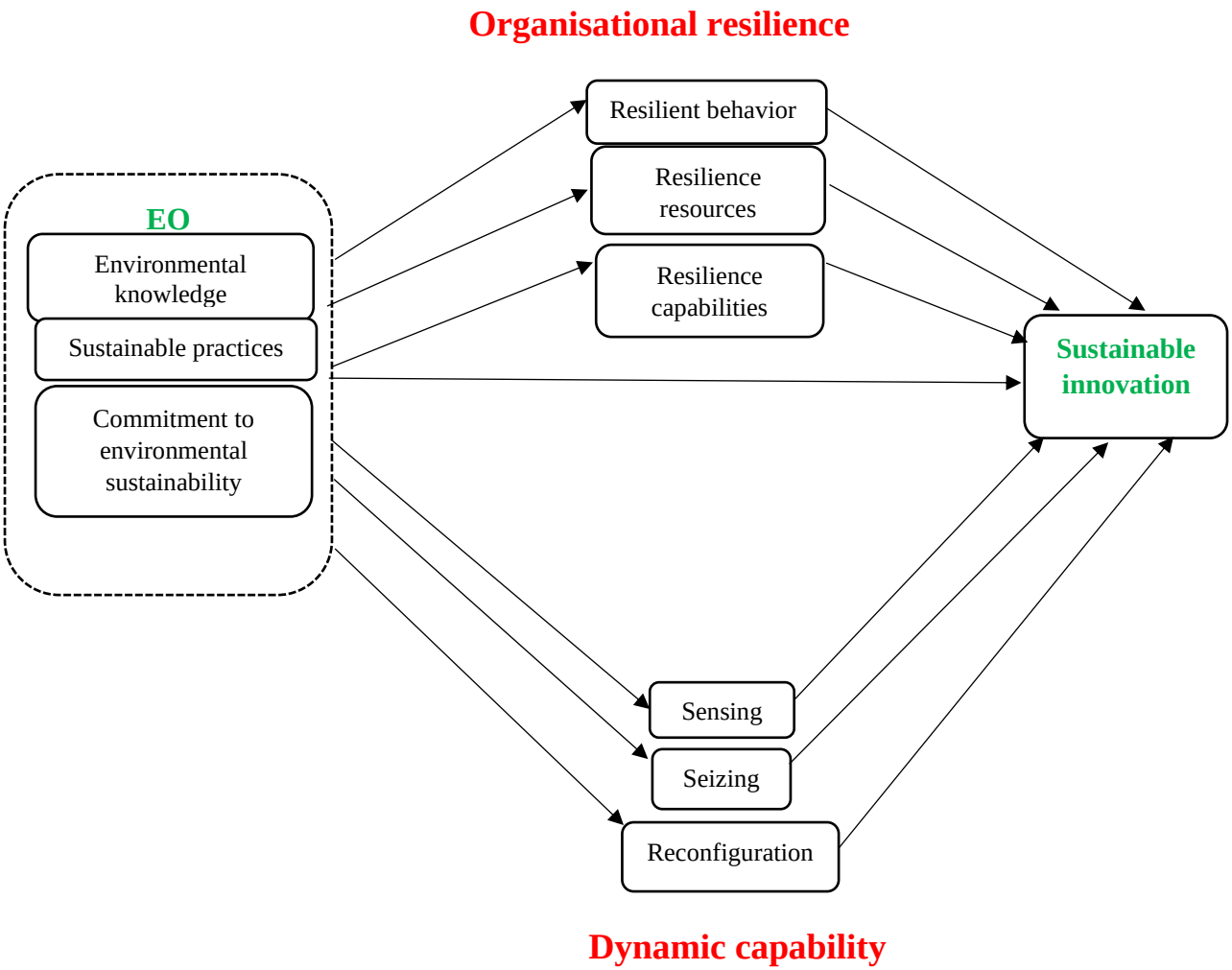



*Fig. 2.1: Research model*

*Source: Author's Own, 2025*

From the direction of the relationship in Figure 2.1 above, environmental orientation is hypothesised to have a significant positive relationship with SMEs' sustainable innovation outcome. Again, organisational resilience is nurtured and created through three distinct practices: resilience behaviour, resource, and capability, which are hypothesised to positively mediate the relationship between environmental orientation and SMEs' sustainable innovation. Finally, dynamic capability, measured by three sub-dimensions, sensing, seizing and reconfiguration, is hypothesised to positively mediate the relationship between environmental sustainable orientation and SMEs' sustainable innovation.

## 2.6 Summary of hypotheses

Guided by the literature reviewed and the conceptual model, the resulting hypotheses are formulated:

**H1:** Environmental orientation positively affects sustainable innovation (*Roxas et al., 2017; Guo & Wang, 2022*).

**H2:** Sensing capability positively mediates the relationship between environmental orientation and sustainable innovation (*Pacheco et al., 2018; Liboni et al., 2023*).

**H3:** Seizing capability mediates the relationship between environmental orientation and sustainable innovation (*Khattab, 2017; Farzaneh et al., 2022*).

**H4:** Reconfiguration capability positively mediates the relationship between environmental orientation and sustainable innovation (*Dangelico et al., 2017; Cristofaro et al., 2025*).

**H5:** Resilience behaviour positively mediates the relationship between environmental orientation and sustainable innovation (*Ismail et al., 2011; Dinh et al., 2024*).

**H6:** Resilient resources positively mediate the relationship between environmental orientation and sustainable innovation (*Berrone et al., 2013; Limnios et al., 2014*).

**H7:** Resilience capability positively mediates the relationship between environmental orientation and sustainable innovation (*Leyva-de la Hiz et al., 2019; Tariq et al., 2023*).

**H8:** Different configurations will produce SMEs sustainable innovation (*Eisenhardt & Martin, 2000; Barreto, 2010; Pappas et al., 2016*)

# 2. METHODOLOGY

The chapter details the epistemological assumption of the study and presents the various approaches from data selection to data analysis. Likewise, how the sample size was determined, as well as issues of common method bias, are dealt with in this chapter. Lastly, the two analytical approaches (i.e., symmetrical and asymmetrical) used for the data analysis are also presented in the chapter.

## 3.1 Research design

The explanatory research design guided the study by emphasising how or why environmental orientation impacts SMEs' sustainable innovation. Again, since the mediating effect of dynamic capability and organisational resilience has not been explored in environmental orientation and sustainable innovation relationships, explanatory design helps robustly examine this less empirically tested phenomenon in a resource-constrained context (i.e., Ghana), guiding future research works. According to Creswell (2014), guided by the research question a study seeks to answer, a study can be aligned with a quantitative, qualitative or mixed method approach (Creswell, 2014). Regarding the present study's research questions, the quantitative research approach was used because the present study collected data on these constructs: environmental orientation, sustainable innovation, organisational resilience (i.e., resilience behaviour, resilience resource and resilience capability), and dynamic capability (i.e., sensing, seizing and reconfiguration), and subsequently used a quantitative measure to assess the relationship between these variables. According to Creswell (2014), the quantitative research approach becomes very useful, especially when a study emphasises understanding the relationship between proposed variables.

## 3.2 Study setting

Ghanaian SMEs were selected as the study context for the following reasons. First, many developing countries have begun institutionalising environmental protective initiatives among SMEs to encourage sustainable production and consumption (Lindley et al., 2018; Adomako, 2021). Such policies have been substantially boosted with the creation of the 'Science, Technology and Innovation Strategy for Africa 2024 (STISA-2024), spearheaded by the African Union. The strategic purpose of this policy is to encourage and support sustainable innovation among small African businesses (Lee & Butler, 2016). Though these policies and regulations can drive environmental sustainability, their implementation has overlooked the peculiar characteristics of SMEs, particularly those operating in highly emerging economies like Ghana (Avenyo, 2018). As most Ghanaian SMEs are non-formalised and have limited access to finances, using Ghanaian SMEs as the study context provides a solid theoretical contribution to understanding how these attributes of a developing economy

influence SMEs' environmental orientation and sustainable innovation outcomes (Arzubiaga et al., 2018). Ghana is one of the first countries in sub-Saharan Africa to implement the 'Boosting Green Employment and Enterprise Opportunities Challenge (GrEEn) Innovation 'project. This is a four-year joint project of the European Union, the Embassy of the Kingdom of the Netherlands in Ghana, the United Nations Capital Development Fund (UNCDF), and the Netherlands Development Organisation (SNV). This not-for-profit international organisation seeks to promote a green and circular economy and encourage green product/service innovation among SMEs (Climateaction. africa, 2022). A recent survey by the Ghana Integrated Business Establishment Survey (2025) established that only 20.0% of Ghanaian SMEs have effectively adopted and integrated environmentally sustainable practices, suggesting that only a handful of businesses implement eco-friendly business practices. Accordingly, using Ghanaian SMEs as the study provides additional perspective to the existing literature by responding to calls for assessing the impact of environmental orientation, dynamic capability and organisational resilience on SMEs' sustainable innovation outcomes (Alshanty & Emeagwali, 2019).

## 3.3 Sample and data collection

The study obtained its data from SMEs in Accra, Tema and Kumasi. According to the Association of Ghana Industries (AGI) (2021), Kumasi, Accra and Tema are three major cities in Ghana with a significant share of SMEs spread in the areas of agro-processing (food and beverages), pharmaceuticals, mining, information technology, utilities, service industries, transport, construction, textiles, and garments and leather (Association of Ghana Industries , 2021). Considering that nearly sixty (60) per cent of the small and medium enterprises are found within the industrial hub of Kumasi, Accra and Tema metropolises, the data sample was primarily drawn from these three major cities (Agyapong, Ayentimi, & Sandow, 2024).

However, power analysis was used to determine the sample size needed to generate a relevant effect size. According to Hintze (2008), the ideal power for a sample size estimation should be >0.8 to minimise the risk of missing an actual effect in survey studies. Following this recommendation, the thresholds were set at a medium effect size of 0.15, a power of 0.95 and an alpha value of 0.05 (Memon et al., 2020). Based on the selected thresholds and with seven predictor variables, the study required a sample size of 153. However, considering issues such as data missing and incompleteness in survey studies, we sampled more SMEs than the estimated power sample size of 153.

The study tested these hypotheses with survey data collected in two waves from 289 SMEs in three cities in Ghana. To produce generalisable results across diverse industries, the selected SMEs operated within the categorisation of mining, construction, manufacturing, export and import and services sectors

(Association of Ghana Industries, 2021). Prior to the commencement of the data collection, the questionnaire was first piloted on a sample of 15 SMEs (not added to the final survey sample) and their responses were used to improve face validity and also ensure that all questions were free from ambiguity (Kmetty & Stefkovics, 2022). The data collection consisted of several processes.

First, to achieve a representative sample, the study adhered to the definitions provided by the Ghana Enterprise Agency and the Ghana Statistical Service, targeting SMEs that employ at least five individuals and have assets not exceeding 10 million Ghanaian cedis (Ghana Enterprise Agency, 2024). Therefore, by using the following criteria: a firm with at least five employees, with assets not exceeding 10 million cedis, with a valid status with the Registrar General, and with at least five years of business operation experience, 425 SMEs were identified. A formal request was made to the National Board for Small Scale Industries (NBSSI) and the Business Advisory Centres (BACs), which operate under the Ghana Enterprise Agency, to assist with the contact details of the managers-owners of these 425 enterprises. After this exercise, only the contact details of 386 firms were retrieved. The managers-owners of these SMEs were contacted via phone and email, requesting their participation in the study. Of the 386 contacted, 52 declined, 45 never responded, and 289 agreed to participate. Both online and personal face-to-face meetings were scheduled with the owner-managers to explain the study's purpose, how confidentiality issues are addressed, and answer any fears about the study. Also, the time for the data collection was agreed upon during these discussions. The owners were requested to provide managers' contact information who could respond to the questionnaire and encourage participation (Chin et al., 2021).

Subsequently, the study reached out to the owner-managers to complete the surveys. Two recruited research assistants sent these questionnaires to the owner-managers in person and returned for the responses after a couple of days. Upon receipt of these questionnaires, the research assistant kept them in designated files to reduce the possibility of swapping the responses across firms (Chen et al., 2022). The data was collected at two different times separated by two-week intervals. Two-wave data collection was used because it allows studies to investigate constructs' chronological precedence (Kline, 2016), providing a more profound understanding of the germane causes of an investigated phenomenon than when cross-sectional data is used (Taris et al., 2021). At wave one, the scale items on environmental sustainable orientation and organisational resilience were measured, and those of sustainable innovation and dynamic capability were measured in wave two. We matched the responses across time lags and sources using a designated file and a unique identifier. In the data analysis, we only included responses from the first and second waves (Colbert et al., 2008). A total of 24 responses were not included because no response was received during the second wave, and 33 were also not included because of incompleteness.

Therefore, 232 was used for the final analysis, giving a response rate of 63%. This response rate is considered adequate, considering the difficulties of collecting data at different waves (Barnes et al., 2016). To check the non-response bias, the study investigated whether the final 232 respondents at wave two (i.e., those who provided data for both T1 and T2) differ from the 24 respondents who provided data for wave one only. Chi-square tests were used to compare the responses of wave one and wave two on the demographic variables (i.e., Age, Gender and Education); results are provided in Appendix A. The wave two responses did not significantly vary from the wave one responses in demographic variables, thus indicating insignificant non-response bias. The sampling chart flow for the sample selection is presented in Figure 3.1 below.

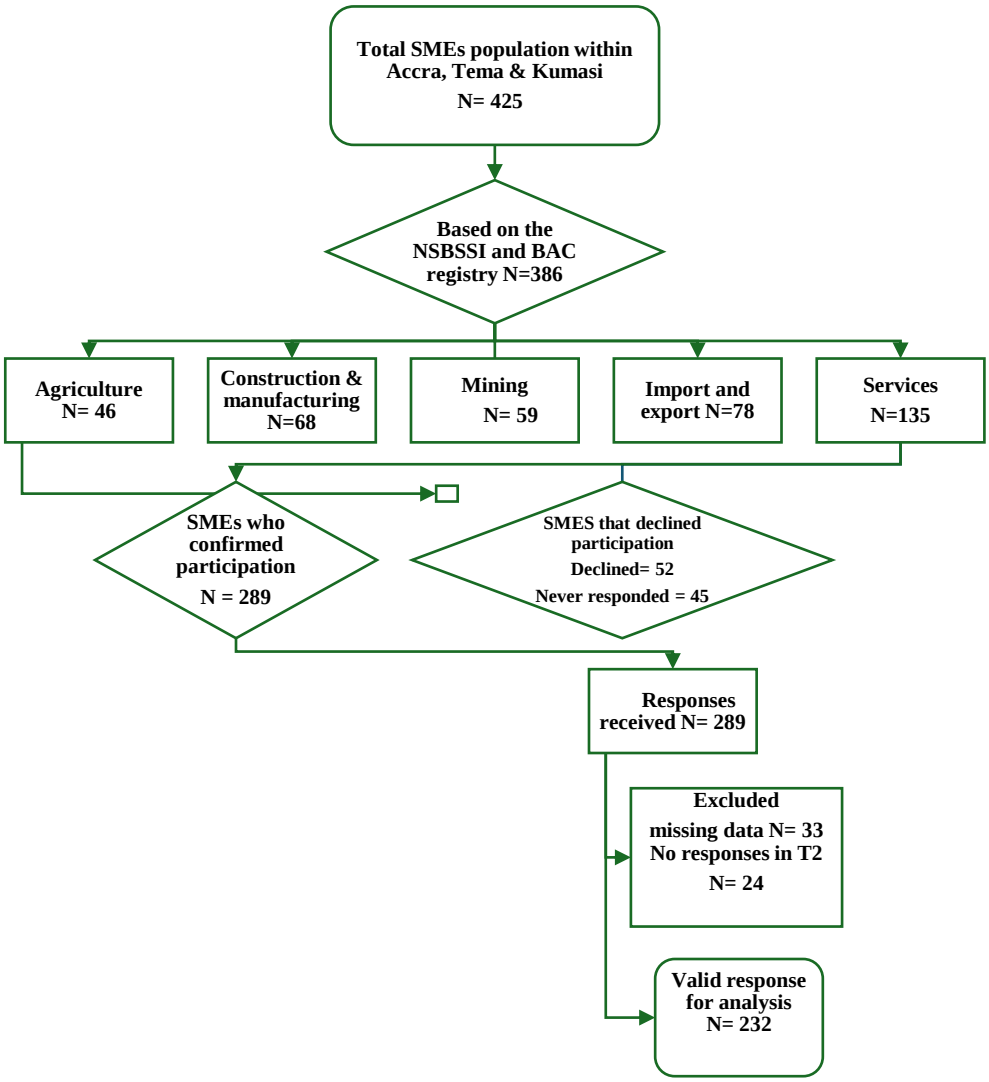



*Fig 3.1 Sampling flow chart*

*Source: Author's Own, 2025*

## 3.4 Measures

The measuring items were adapted from validated scales. Except for the firm's characteristics scale, all the other items were measured by a five-point Likert scale (1=strongly disagree to agree 5=strong). Specifically, environmental orientation was assessed on a three-dimensional scale, comprising knowledge of the environment, practices, and commitment to environmental sustainability (Roxas et al., 2017). Five items measured ecological knowledge, while sustainable practices were assessed with eight items. The last dimension under environmental orientation, environmental sustainability, was measured by four items (Roxas et al., 2017; Guo & Wang, 2022).

With sustainable innovation, earlier studies measured the construct either by the number of patents (Li et al., 2017; Aldieri et al., 2019), ISO14001 certification (Li et al., 2018) or by survey items (Cai & Li, 2018). Following the studies of Chang (2011), De Marchi (2012) and Guo et al. (2020), survey items were employed to measure the sustainable innovation construct. It comprised six items and was measured by a five-point scale (1=strongly disagree and 5=strongly agree). Moreover, the dynamic capability is a first-order reflective construct (sensing, seizing and reconfiguring), which was adapted from the studies of Mikalef and Pateli (2016), Protogerou et al. (2012) and Ilmudeen et al. (2021). It comprised eleven items and was measured by a five-point scale (1=strongly disagree to 5=strongly agree). Organisational resilience is conceptualised as a latent and higher-order construct with three-dimensional scales: resilient behaviour, resilience resource and resilience capabilities (Hillmann & Guenther, 2021). Four items each measured resilient behaviour, resilience resource and resilience capabilities. The scale was adapted from Kantur and Iseri-Say (2015).

To ensure the suitability of the construct to the study context, guided by the recommendations of Melián-Alzola et al. (2020), four researchers and/or professionals in SMEs and environmental sustainability were consulted, considering their teaching experience, scientific publications, professional experience, consultancy engagements, and involvement in co-operative assignments within the SME sector. Specifically, two professionals were university professors with at least four years of extensive research experience into SMEs. The remaining two were working professionals with affiliations in the SME sector and over five years of experience in SME consulting and management. Their feedback was used to modify the questionnaire, and a pre-test was conducted with 15 SME. After this exercise, their feedback was integrated into the final questionnaire development. The construct definitions and their corresponding sources are provided in Table 3.1.

Table 3.1 Construct/variable definitions & items sources

| | Construct/Variable | Definition | Items | Source Adapted |
|---|---|---|---|---|
| | | **Environmental orientation** | | |
| 1 | Environmental knowledge (Env. K) | Environmental knowledge assesses management's overall understanding of environmental issues within their operations and locality (Roxas et al., 2017). | **Env.K1:** Management has adequate knowledge about climate change.<br>**Env. K 2:** We are aware of the waste management issues in the city.<br>**Env. K 3:** We sufficiently deal with issues about drinking water sources.<br>**Env.K4:** Issues concerning the source of electricity are tackled in this organisation.<br>**Env.K5:** Environmental protection programs are instituted in this entity. | Roxas et al. (2017) |
| 2 | Sustainable practices (Sus. P) | Sustainable practices measure the extent to which a firm/management undertakes certain sustainable practices in their production process (Roxas et al., 2017) | **Sus.P1**: We practice recycling waste.<br>**Sus.P2**: Water and electricity conservation are adhered to in this organisation.<br>**Sus.P3**: Training employees on environmental awareness is continuously done.<br>**Sus.P4:** Participation in environmental programs is a common practice in this organisation | Roxas et al. (2017)<br>Danso et al. (2019) |

| | | | | |
|---|---|---|---|---|
| | | | **Sus.P5**: Low-impact manufacturing technology is always procured.<br>**Sus.P6**: Always communicate with customers/buyers to identify their environmental needs<br>**Sus.P7**: We always prefer to deal with environmentally friendly suppliers.<br>**Sus.P8**: Sustainability is integral to our business plans and operations. | |
| 3 | Commitment to environmental sustainability (Com. Sus) | Commitment to environmental sustainability assesses management/firms' obligation towards ecological principles and practices (Roxas et al., 2017). | **Com.Sus1**: Environmental protection is part of our business model<br>**Com.Sus2**: Environmental practices are suitable for my business.<br>**Com.Sus3**: We gain more customers due to our environmental identity<br>**Com.Sus4**: Doing business in the local community is always our priority | Roxas et al. (2017)<br>Danso et al. (2019) |
| | | **Organisational resilience** | | |
| 1 | Resilient behaviour (RB) | Resilient behaviour is described as the<br>within a typology | **RB1**: The business I work with stands straight and is adequately intense to cement its position.<br>**RB2:** Our firm is effective in producing varied solutions. | Kantur and Iseri-Say (2015) |

| | | | | |
|---|---|---|---|---|
| | | the communicative mentality within the group (Ishak & Williams, 2018) | **RB3**: The organisation quickly responds to new market changes<br>**RB4:** Our firm recognises that the ups and downs in project management are inevitable. | |
| 2 | Resilience resource (RR) | Resilience resources constitute the internal and external organisational skills, resources and functional competencies that enable them to match their activities to the business-changing Environment (Limnios et al., 2014) | **RR1**: We frequently develop alternatives to benefit from adverse circumstances.<br>**RR2**: Our firm is agile in taking required action when needed.<br>**RR3**: Our firm is where all the employees are engaged to do what is required.<br>**RR4:** Our organisation sees failure as a learning opportunity. | Kantur and Iseri-Say (2015) |
| 3 | Resilience capabilities (RC) | Resilience) capabilities demonstrate the capacity of a firm to counteract (or endure) and bear the consequences of change or a disruptive occurrence (Gilly, Kechidi, & Talbot, 2014) | **RC1:** This organisation successfully acts in a unified manner with all of its employees.<br>**RC2:** This firm shows resistance to the end in order not to lose<br>**RC3:** Our firm does not give up and continues its path.<br>**RC4:** We will likely recover from a significant defect after the first attempt. | Kantur and Iseri-Say (2015) |
| | | | **Dynamic capability** | |

| | | | |
|---|---|---|---|
| 1 Sensing (SEN) | Sensing capability is recognising, understanding, and chasing market opportunities (Pavlou & Sawy, 2011). | **SEN1:** Our company is up to date on the current environmental market situation.<br>**SEN2:** Our organisation systematically looks for information on the current market situation.<br>**SEN3**: Our company continuously monitors our competitors' environmental activities. | |
| 2 Seizing (SEZ) | Seizing assesses how a firm identifies opportunities, selects a business model responsive to the seized opportunity, develops/channels the necessary resources, and commercialises the product (Helfat & Winter, 2011). | **SEZ1:** We identify what new environmental information can be used in our company.<br>**SEZ2:** Our company can turn new environmental knowledge into process and product innovation.<br>**SEZ3:** We recognise what new information can be utilised in our company.<br>**SEZ4:** Current environmental information leads to the development of new products or services | Mikalef & Pateli (2016), Protogerou et al. (2012)<br>Ilmudeen et al. (2021) |
| 3 Reconfiguration (RE) | Reconfiguration assesses how a firm develops/channels the necessary resources, commercialises the product and reorganises its resources to accomplish the newly identified | **RE1**: We modify our organisational structure to focus on environmental sustainability (e.g., creating a new division, reconfiguring product lines).<br>**RE2**: We adjust our product development teams to include environmental specialists. | |

| | | | | |
|---|---|---|---|---|
| | | opportunity (Helfat & Winter, 2011). | **RE3:** We frequently adjust our relationships with suppliers (e.g., supplier environmental audit, changing suppliers) to reduce the environmental impact of products.<br>**RE4**: We consciously train (e.g., through attendance at conferences, workshops, courses) our product development team members to upgrade their environmental knowledge and competencies | Mikalef & Pateli (2016), Protogerou et al. (2012)<br>Ilmudeen et al. (2021) |
| | | | **Sustainable innovation** | |
| 1 | Sustainable innovation (SI) | Sustainable innovation seeks to lessen environmental dangers enhance resource efficiency and consequently allow it to achieve sustainable development goals (Albort-Morant et al., 2018). | **SI1**: The final product uses recycled materials<br>**SI2**: We frequently use renewable energy sources and waste materials for our new product development.<br>**SI3**: The final product is reusable<br>**SI4:** The manufacturing process has a competitive record on energy consumption (e.g., gas and electricity)<br>**SI5:** The final product is environmentally friendly. | Chang (2011),<br>De Marchi (2012)<br>Guo et al. (2020) |

| | |
|---|---|
| | **SI6:** The end product is always responsive to eco-conscious consumers. |

Source: Author's Own 2025

### 3.5 Common method bias

Unlike larger firms, many SMEs' strategic decisions are monadic and generally taken solely by the owner or manager without involvement with other parties or agents. This means that, across many SMEs, a single decision-maker is responsible for most of their firms' strategic management functions. Accordingly, using multiple sources of respondents in SMEs will limit us from fully grasping what goes into SMEs' strategic management decisions (Kull et al., 2018). Accordingly, using a Type 1 design (i.e., a single respondent for all items) has been deemed very appropriate, especially when dealing with SMEs (Kull et al., 2018). Notwithstanding the depth of data associated with Type 1 designs in SMEs, issues such as items' features, self-report assessment, and collecting both the explanatory variable and dependent variable could affect the validity of the results. This phenomenon, called common method bias (CMB), is described as bias that occurs because of the errors connected with the process or method of assessment instead of the actual explanatory effect on the measured constructs (Podsakoff et al., 2012). This could produce false outcomes, primarily when appropriate procedural measures are not utilised to control or minimise its occurrence. In this study, procedural and statistical procedures were used to minimise the effect of CMB occurrences on the study conclusions. With the procedural approach, the study used several solutions (1) ensuring respondents' anonymity, (2) explaining the study purpose to the respondent, (3) collecting the data at different times, and (4) including a different measuring scale between the dependent and independent variables (Podsakoff et al., 2012; Mackenzie & Podsakoff, 2012).

Though collecting the data on different periods and from diverse responses in the survey design minimised the possibility of common method bias (CMB), the study tested for common method variance (Podsakoff et al., 2012). First, two items from Crowne and Marlowe's (1960) social desirability scale, "I never hesitate to go out of my way to help someone in trouble and "I am always courteous, even to disagreeable people", were used as the marker variable to measure their relationships with the primary construct. The findings from the marker variable estimate confirm that the changes in the R-squared values for organisational resilience (i.e., behaviour, resource and capability), dynamic capability (i.e., sensing, seizing and reconfiguration) and sustainable innovation were significantly lower than the recommended variation of 10%, suggesting that CMB was not a serious issue in this study (Chin et al., 2013). Also, Harman's single–factor principal component analysis was used by restricting all the scale items and loading them onto a single factor (Podsakoff et al., 2012). The total difference explained by a single factor component stood at 36.49% confirming that CMB is not a severe concern in this study, as the cumulative percentage variance was <50% (Malhotra et al., 2017).

## 3.5 Analytical methods

### 3.5.1 Analytical strategy and justification

As mentioned earlier, two distinct analytical approaches, symmetrical and asymmetrical, were jointly used to understand the relationship between environmental orientation and SMEs' sustainable innovation. Specifically, partial least squares structural equation modelling (PLS-SEM) was first used for the symmetrical approach to test the proposed model. PLS-SEM has been established to optimise the difference in the dependent variable rather than the factor-based approach used in covariance-based SEM (CB-SEM) (Hair et al., 2019). Considering that the proposed model is complex (i.e., characterised by more constructs and relationships), using PLS-SEM is very effective because of its ability to consider the entire model during the parameter estimation simultaneously (Hair et al., 2019; Benitez et al., 2020). Again, as the study sample size represents SMEs in Ghana, PLS-SEM has proven more beneficial to a sample of such characteristics than other SEM-based approaches and is robust in explicitly estimating latent variable scores (Hair et al., 2019). This study, therefore, used the SmartPLS 4.1 application to assess the study model.

The fuzzy set qualitative comparative analysis (fsQCA) was used for the asymmetrical approach. The fsQCA is a configurational approach that links quantitative and qualitative approaches by examining alternative models (i.e., not just one single model fitting all cases) using data obtained from the quantitative method (Olya et al., 2020). Unlike the symmetrical analysis, the configurational analysis explores the unequal relationships between the investigated constructs and the outcome of interest, pointing out the diverse configurations that explain an outcome. Therefore, by using configurational analysis (fsQCA), it complements and extends the findings from symmetric analysis by producing more nuanced explanations of the different levels of organisational resilience, whose presence is a necessary and sufficient requirement for SMEs' sustainable innovation outcomes (Woodside, 2014; Pappas et al., 2016). For instance, as a destination is often reached via several routes, an outcome may be achieved in several ways, predicted by different combinations of antecedent factors (Pappas & Woodside, 2021). FsQCA involves three steps: data calibration, truth tabulation, and counterfactual analyses (Olya & Han, 2020).

# 4. DATA ANALYSIS AND PRESENTATION OF FINDINGS

## 4.1 Introduction

This chapter presents the analysis of the data obtained from the understudied SMEs. It begins with the demographic analysis of the SMEs. As this chapter involves symmetrical analysis, PLS-SEM was mainly used. Several analytical procedures were performed with the PLS-SEM. Prior to the commencement of measurement model assessment, validity and reliability checks were performed on the data using the confirmatory factor analysis (CFA). Other quality checks, such as convergent validity, composite reliability (CR), and discriminant validity, were also assessed. The structural model assessment was performed after meeting the basic quality assessment thresholds. With the structural model assessment, the 10,000 bootstrapping algorithm was used to assess all the paths' level of significance. The chapter ends with the mediation analysis. With the mediation analysis, Baron and Kenny's (1986) three-step mediation procedure was followed.

## 4.2 Demographic Profile of SMEs

The results of the respondents' demographics and the SMEs' characteristics have been presented in Table 4.1

Table 4.1 Demographic characteristics

| Variable | Frequency | Per cent |
|---|---|---|
| **Gender** | | |
| Male | 143 | 61.6 |
| Female | 89 | 38.4 |
| **Age** | | |
| 25-35 years | 32 | 13.8 |
| 36-45 years | 63 | 27.2 |
| 46-55 years | 78 | 33.6 |
| >55 years | 59 | 25.4 |
| **Education qualification** | | |
| Basic level | 24 | 10.3 |
| Secondary level | 38 | 16.4 |
| Vocational/technical | 42 | 18.1 |
| Diploma degree | 49 | 21.1 |
| Bachelor’s degree | 56 | 24.1 |
| Master’s degree | 23 | 9.9 |

| | | |
|---|---|---|
| **Position** | | |
| Manager | 92 | 39.7 |
| Owner | 73 | 31.5 |
| Manager/owner | 67 | 28.8 |
| **Distribution of the SMEs** | | |
| Accra | 100 | 43.1 |
| Tema | 29 | 12.5 |
| Kumasi | 103 | 44.4 |
| **Industries** | | |
| Agriculture | 26 | 11.2 |
| Construction & manufacturing | 27 | 11.6 |
| Mining | 24 | 10.3 |
| Export and import | 59 | 25.4 |
| Services | 96 | 41.4 |
| **Firm size** | | |
| <10 employees | 10 | 4.3 |
| 11-25 employees | 142 | 61.2 |
| 26-50 employees | 58 | 25.0 |
| >50 employees | 22 | 9.5 |
| **Firm years** | | |
| 1-5 years | 35 | 15.1 |
| 6-10 years | 125 | 53.9 |
| >11 years | 72 | 31.0 |

*(Source: Author's own, 2025)*

The results in Table 4.1 reveal that from the total of 232 valid responses, 143(61.6%) were males, with 89(38.4%) being females. With the age distribution of the respondents, the results in Table 4.1 suggest that whereas 95(41.0%) had their ages within the age bracket of 25-35 years, 78(33.6%) had their ages within the bracket of 33.6% and 59(25.4%) had their ages above 55 years. Regarding the academic qualification of the respondents, 24(10.3%) had their academic qualification up to the basic school level (i.e., Junior High School), 38(16.4%) had secondary education, 42(18.1%) had vocational/technical qualifications, and 49(21.1%) had a diploma qualification. Also, results from Table 4.1 reveal that 34.0% of the respondents had a tertiary academic qualification (i.e., 24.1% for a bachelor's degree and 9.9% for a master's degree). With the respondent's position, the results in Table 4.1 suggest that 92(39.7%) held the role as managers, 73(31.5%) occupied the position as owners, and 67(28.8%) performed the role as

manager/owner. Across the three cities sampled, 100(43.1%) and 29(12.5%) of the sampled SMEs operated in Accra and Tema, respectively, whereas 103(44.4%) operated from the Greater Kumasi Metropolis. In the industries the sampled SMEs operated in, 26(11.2%) worked in the agriculture sector, 27(11.6%) of the SMEs activities fell within the construction and manufacturing sector, 24(10.3%) worked within the mining industry, 59(25.4%) operated in the import and export sector and 96(41.4%) worked in the service sector. Results from the study are consistent with the recent survey by the Ghana Integrated Business Establishment Survey (2025), where SMEs' activities were mainly dominated in the agriculture and import and export sectors. With the size of the SMEs, measured by the number of employees engaged, the results in Table 4.1 suggest that 10(4.3%) of the SMEs' employees were less than 10, 200(86.2%) of the SMEs' employees were within the range of 11-50, and 22(9.5%) had more than 50 employees. Lastly, on the SMEs' years of existence, the results in Table 4.1 suggest that 35(15.1%) of the SMEs have been in operation for a period of 1-5 years, 125(53.9%) have existed for the period of 6-10 years, and 72(31.0%) have operated for a period of over 11 years. Results from the study corroborate the findings of the Ghana Enterprise Agency (2024), where their framework confirms that a well-functioning SME should have been in operation for a minimum of five years.

### 4.3 Measurement model assessment

First, validity and reliability checks were performed on the data using the confirmatory factor analysis (CFA). Specifically, Amos 28.0 was used with the CFA. Results from the CFA confirmed a good model fit ($\chi^2$= 191.085; df = 147; $p<0.001$; $\chi^2/df$ = 2.691; GFI = 0.845; CFI = 0.930; TLI = 0.910; NFI = 0.894; RMSEA = 0.041 (Hu & Bentler, 1999; Kline, 2016). Though NFI failed to meet the 0.90 threshold, because of its responsiveness to complex models and large sample sizes, the recorded value of 0.894 is considered adequate since it is still close to the threshold value (Schuberth et al., 2023). After the CFA, the traditional measurement indicators, convergent, discriminant, and construct validity, were utilised to examine the model using the Smart-PLS 4.1 (Hair et al., 2019; Bandalos, 2018). The average variance extracted (AVE) and factor loadings were used to evaluate convergent validity (Bandalos, 2018). Theoretically, an AVE value higher than 0.5 has been considered to provide strong empirical support for convergent validity (Fornell & Larcker, 1981).

Additionally, an indicator factor loading of 0.6 or more has been identified to be sufficient, as it suggests that more than 50% of the change in a single indicator can be described by the corresponding latent variable (Benitez et al., 2020). Specifically, with the assessment of the convergent validity of the scale items, the values on average variance extracted (AVE) and composite reliability (CR) reported in Table 4.2 were all above the recommended threshold of 0.50 and 0.60,

respectively (Nunnally & Bernstein, 1994). With the factor loadings, except for one environmental orientation item and one sustainable innovation item, whose factor loadings were <0.6, all the other loadings exceeded 0.6 (Hair et al., 2019). According to Malhotra and Dash (2011), an item whose loading factor is less than the recommended threshold can still be included in the model estimation when its presence does not affect the scales' validity and reliability. Accordingly, the sustainable innovation item with a factor loading 0.562 was not deleted. In contrast, the fifth item under environmental knowledge was deleted as it affected the reliability check of the construct.

Lastly, the tolerance value and variance inflation factor (VIF) of each scale were evaluated to establish whether both were within the suggested thresholds, that is, tolerance value > 0.1 and VIF < 5 (Roberts & Thatcher, 2009). After this assessment, all the scales' values were in line with requirements, suggesting that multicollinearity is not a serious issue to be concerned about in this study.

Table 4.2 Factor loadings, construct reliability, and validity

| **Constructs** | **Items** | $\widehat{\lambda_i}$ | **α** | **AVE** | **CR** | **SQRT (AVE)** | **Mean** | **SD** | **Outer VIF** |
|---|---|---|---|---|---|---|---|---|---|
| **Reflective measurement** | | | | | | | | | |
| Sustainability orientation | | | **0.932** | **0.561** | **0.942** | **0.749** | | | |
| **Commitment to the environment** | | | | | | | | | |
| | SO1 | 0.831 | | | | | 3.224 | 1.211 | 3.999 |
| | SO2 | 0.810 | | | | | 3.19 | 1.133 | 3.026 |
| | SO3 | 0.811 | | | | | 3.435 | 1.251 | 3.026 |
| | SO4 | 0.818 | | | | | 2.81 | 1.186 | 2.902 |
| **Environmental knowledge** | | | | | | | | | |
| | SO5 | 0.757 | | | | | 4.095 | 0.852 | 1.801 |
| | SO6 | 0.780 | | | | | 4.245 | 0.862 | 2.240 |
| | SO7 | 0.786 | | | | | 4.102 | 0.886 | 2.048 |
| | SO8 | 0.733 | | | | | 3.602 | 1.431 | 1.564 |
| **Sustainable practices** | | | | | | | | | |
| | SO9 | 0.722 | | | | | 3.034 | 1.459 | 2.258 |
| | SO10 | 0.787 | | | | | 3.639 | 1.304 | 2.609 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | SO11 | 0.714 | | | | | 3.626 | 1.15 | 1.955 |
| | SO12 | 0.778 | | | | | 3.299 | 1.175 | 2.704 |
| | SO13 | 0.805 | | | | | 3.306 | 1.243 | 3.081 |
| | SO14 | 0.836 | | | | | 3.497 | 1.157 | 4.339 |
| | SO15 | 0.877 | | | | | 3.234 | 1.258 | 2.287 |
| | SO16 | 0.893 | | | | | 3.442 | 1.171 | 2.594 |
| **Organisational resilience** | | | | | | | | | |
| **Resilience behaviour** | | | **0.800** | **0.625** | **0.869** | **0.791** | | | |
| RB1 | | 0.768 | | | | | 4.442 | 0.681 | 1.625 |
| RB2 | | 0.776 | | | | | 4.313 | 0.637 | 1.811 |
| RB3 | | 0.778 | | | | | 4.252 | 0.689 | 1.812 |
| RB4 | | 0.781 | | | | | 4.095 | 0.953 | 1.630 |
| **Resilience resource** | | | **0.808** | **0.724** | **0.887** | **0.851** | | | |
| RR1 | | 0.781 | | | | | 4.429 | 0.639 | 1.625 |
| RR2 | | 0.870 | | | | | 4.374 | 0.586 | 1.811 |
| RR3 | | 0.797 | | | | | 4.395 | 0.542 | 1.812 |
| RR4 | | 0.823 | | | | | 3.545 | 1.334 | 1.630 |
| **Resilience capabilities** | | | **0.906** | **0.780** | **0.934** | **0.833** | | | |
| RC1 | | 0.870 | | | | | 4.483 | 0.893 | 2.445 |
| RC2 | | 0.883 | | | | | 4.388 | 0.553 | 2.651 |
| RC3 | | 0.876 | | | | | 4.463 | 0.673 | 2.561 |
| RC4 | | 0.868 | | | | | 4.095 | 0.953 | 2.347 |
| **Dynamic capability** | | | | | | | | | |
| **Sensing** | | | **0.796** | **0.711** | **0.880** | **0.843** | | | |
| Sen1 | | 0.852 | | | | | 2.273 | 1.101 | 1.962 |
| Sen2 | | 0.772 | | | | | 3.346 | 1.140 | 1.441 |
| Sen3 | | 0.902 | | | | | 2.680 | 1.185 | 2.158 |
| **Seizing** | | | **0.874** | **0.725** | **0.913** | **0.851** | | | |
| Seiz1 | | 0.867 | | | | | 2.628 | 1.238 | 2.673 |
| Seiz2 | | 0.852 | | | | | 3.013 | 1.236 | 2.540 |
| Seiz3 | | 0.815 | | | | | 2.952 | 1.144 | 1.935 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Seiz4 | 0.872 | | | | | 3.351 | 1.110 | 2.311 |
| **Reconfiguration** | | **0.901** | **0.772** | **0.931** | **0.879** | | | |
| Recon1 | 0.845 | | | | | 2.931 | 1.246 | 2.570 |
| Recon2 | 0.926 | | | | | 2.286 | 0.970 | 3.916 |
| Recon3 | 0.849 | | | | | 2.325 | 1.114 | 2.237 |
| Recon4 | 0.891 | | | | | 2.489 | 1.143 | 2.800 |
| **Sustainable innovation** | | **0.842** | **0.566** | **0.885** | **0.752** | | | |
| SI 1 | 0.811 | | | | | 4.361 | 0.67 | 1.912 |
| SI 2 | 0.734 | | | | | 4.333 | 0.722 | 2.154 |
| SI 3 | 0.792 | | | | | 4.374 | 0.702 | 2.503 |
| SI 4 | 0.835 | | | | | 4.422 | 0.689 | 2.216 |
| SI 5 | 0.550 | | | | | 4.469 | 0.712 | 1.259 |
| SI 6 | 0.755 | | | | | 3.034 | 1.346 | 1.902 |

*Note: EO= environmental orientation, RB= resilience behaviour, RR= resilience resource, RC= resilience capabilities, Sen = sensing, Seiz = seizing, Recon = reconfiguration, SI= sustainable innovation, AVE = average variance extracted, $\widehat{\lambda_i}$ = factor/component loadings, SQRT (AVE) = square root of average variance extract, α = Cronbach's alpha*

*(Source: Author's own, 2025)*

Table 4.3 Interscale correlations and discriminant validity

| | **EO** | **RB** | **RC** | **RR** | **Reconf** | **SI** | **Seiz** | **Sen** |
|---|---|---|---|---|---|---|---|---|
| **EO** | **0.749** | 0.649 | 0.814 | 0.830 | 0.703 | 0.683 | 0.684 | 0.771 |
| **RB** | 0.649 | **0.791** | 0.582 | 0.534 | 0.345 | 0.465 | 0.458 | 0.452 |
| **RC** | 0.714 | 0.582 | **0.833** | 0.785 | 0.638 | 0.732 | 0.594 | 0.669 |
| **RR** | 0.730 | 0.534 | 0.785 | **0.851** | 0.588 | 0.701 | 0.536 | 0.611 |
| **Reconf** | 0.703 | 0.345 | 0.638 | 0.588 | **0.879** | 0.741 | 0.735 | 0.775 |
| **SI** | 0.683 | 0.465 | 0.732 | 0.701 | 0.741 | **0.752** | 0.635 | 0.680 |
| **Seiz** | 0.684 | 0.458 | 0.594 | 0.536 | 0.735 | 0.635 | **0.851** | 0.786 |
| **Sen** | 0.771 | 0.452 | 0.669 | 0.611 | 0.775 | 0.680 | 0.786 | **0.843** |

*Note: EO= environmental orientation, RB= resilience behaviour, RR= resilience resource, RC= resilience capabilities, Sen = sensing, Seiz = seizing, Recon = reconfiguration, SI= sustainable innovation*

Note: Figures in bold denote the square root of the AVE of each study construct, below the diagonal represents interconstruct correlations (Fornell–Larcker), and above the diagonal indicates HTMT

*(Source: Author's own, 2025)*

Table 4.4 Discriminant validity results- Fornell-Larcker criterion

| | EO | RB | RC | RR | Reconf | SI | Seiz | Sen |
|---|---|---|---|---|---|---|---|---|
| **EO** | **0.844** | | | | | | | |
| **RB** | 0.649 | **0.776** | | | | | | |
| **RC** | 0.830 | 0.582 | **0.874** | | | | | |
| **RR** | 0.718 | 0.534 | 0.785 | **0.819** | | | | |
| **Reconf** | 0.703 | 0.345 | 0.638 | 0.588 | **0.878** | | | |
| **SI** | 0.683 | 0.465 | 0.732 | 0.701 | 0.741 | **0.754** | | |
| **Seiz** | 0.684 | 0.458 | 0.594 | 0.536 | 0.735 | 0.635 | **0.852** | |
| **Sen** | 0.771 | 0.452 | 0.669 | 0.611 | 0.775 | 0.680 | 0.786 | **0.843** |

*Note: EO= environmental orientation, RB= resilience behaviour, RR= resilience resource, RC= resilience capabilities, Sen = sensing, Seiz = seizing, Recon = reconfiguration, SI= sustainable innovation*

*(Source: Author's own, 2025)*

Table 4.5 Discriminant validity results- Heterotrait-monotrait ratio (HTMT) criterion

| Constructs | EO | RB | RC | RR | Reconf | SI | Seiz | Sen |
|---|---|---|---|---|---|---|---|---|
| **EO** | | | | | | | | |
| **RB** | 0.673 | | | | | | | |
| **RC** | 0.842 | 0.684 | | | | | | |
| **RR** | 0.824 | 0.610 | 0.841 | | | | | |
| **Reconf** | 0.232 | 0.160 | 0.204 | 0.259 | | | | |
| **SI** | 0.733 | 0.608 | 0.818 | 0.820 | 0.266 | | | |
| **Seiz** | 0.697 | 0.592 | 0.811 | 0.745 | 0.281 | 0.836 | | |
| **Sen** | 0.818 | 0.547 | 0.704 | 0.674 | 0.173 | 0.782 | 0.800 | |

*Note: EO= environmental orientation, RB= resilience behaviour, RR= resilience resource, RC= resilience capabilities, Sen = sensing, Seiz = seizing, Recon = reconfiguration, SI= sustainable innovation*

*(Source: Author's own, 2025)*

The heterotrait-monotrait (HTMT) ratio was utilised to assess the empirical support for discriminant validity. Emerging evidence has shown that the HTMT assessment criteria produce a more robust discriminant validity assessment than the often-used measures, such as the Fornell–Lacker criterion and cross-loadings (Henseler et al., 2015). Nonetheless, the results from the Fornell-Larcker

assessment were still reported as any violation of its criterion can still serve as a basis for the occurrence of discriminant validity problems (Henseler et al., 2015). From the Fornell-Larcker assessment, the square root of the AVE of each variable should be greater than the construct's highest correlation with any other variable in the model. Per the results in Table 4.4, the reflective variables EO, RB, RC, RR, Reconf, SI, Seiz and Sens had AVE square root values of 0.844, 0.766, 0.874, 0.819, 0.878, 0.754, 0.852, and 0.843, respectively. Generally, the square root of the AVE values for all the reflective constructs is greater than the correlation of these variables with other latent constructs in the model, confirming that all the variables of interest in the study model assessed a distinct concept. This confirms that discriminant validity is not a significant issue in this study.

However, as pointed out earlier, the Fornell-Larcker assessment does not consistently identify discriminant validity issues; the HTMT ratio was equally tested to confirm whether the result obtained from the Fornell-Larcker criterion is reliable. Guided by the recommendation of the extant literature, to achieve either a stricter threshold or a more lenient threshold, the HTMT value should be lower than 0.85 and 0.90, respectively (Voorhees et al., 2016; Franke and Sarstedt, 2019). Results in Table 4.5 reveal that the HTMT scores for all the constructs were <0.85, suggesting that all the constructs were conceptually different. This confirms that discriminant validity is not a severe issue in this study. Again, the square roots of AVE to the interconstruct correlation coefficients were compared to confirm whether they correlate (Henseler et al., 2015; Hair et al., 2019). Results in Table 4.3 confirm that the square roots of AVE to the interconstruct correlation coefficients do not correlate, affirming the results of the HTMT in Table 4.5 (Henseler et al., 2015; Hair et al., 2019).

## 4.4 Structural model assessment

### 4.4.1 Testing of direct relationships

After all the reliability and validity checks were performed, the constructs' relationship was assessed using SmartPLS. With the structural model assessment, the 5,000 bootstrapping algorithm was used to assess all the paths' level of significance. The parameters employed to assess the path coefficients are the β, SD, t-values, p-values, and confidence intervals. Guided by the recommendations of the extant literature, the t-values ought to be greater than or equivalent to 1.96 at a 95% confidence level for the path to be considered significant (Hair et al., 2019; Asante, 2023). Considering that the exogenous variable in this study, environmental sustainable orientation, was conceptually developed as a higher-order construct with more specific sub-components (i.e., lower-order components), it is recommended to employ the proper estimation procedure, the repeated indicators method or the two-stage approach (Ringle et al., 2012; Sarstedt et al., 2019).

Becker et al. (2012) assessed both methods for reflective-reflective and reflective-formative types of higher-order constructs in a large-scale simulation study and concluded. However, the repeated indicators method reports smaller biases in assessing the higher-order construct's measurement model (i.e., the relations between lower- and higher-order components). Nonetheless, the two-stage method produced a better parameter recovery of paths pointing (1) from the independent variable to the higher-order construct, and (2) from the higher-order construct to the independent variable in the path model. Sarstedt et al. (2019) confirmed using the latter approach, as their results revealed that the repeated indicators and two-stage approaches usually report highly similar results when sample sizes are adequately large. Accordingly, this study used the two-stage method for path estimation.

With the disjoint two-stage approach, first the study created and estimated the original model as displayed in Appendix B, connecting all the antecedent constructs (EO) to the lower-order components, environmental knowledge, commitment to the environment and sustainable practices and together with the mediating (i.e., organisational resilience and dynamic capability) and dependent variable, sustainable innovation. The model assessment first focuses on the reflective measurement models of the lower-order components, which, as reported in Tables 4.2 and 4.3, meet all the reliability and validity assessment checks (i.e., internal consistency, convergent validity, and discriminant validity). With the second phase, the latent variable scores of the lower-order components of environmental knowledge, commitment to the environment and sustainable practices obtained from stage one were used to create and estimate the stage two model, as shown in Figure 4.1. With the statistical significance of the path coefficients, their corresponding p-value should be less than 0.05. Lastly, with the path coefficient confidence interval (i.e., lower bound- upper bound), the lower bound- upper bound should not contain zero for a hypothesised relationship to be confirmed. The results of the path coefficients guided by these assessment indicators are presented in Table 4.6 and Figure 4.2 below.

Table 4.6 Results of the structural model path coefficients

| Paths | Coeff (β) | SD | T-values | $F^2$ | 97.5% CI | VIF | P values |
|---|---|---|---|---|---|---|---|
| EO -> RB | | | | 0.352 | [0.535, 0.743] | | |
| | 0.695 | 0.053 | 12.210 | | | 1.000 | 0.000*** |
| EO -> RC | | | | 0.416 | [0.781, 0.896] | | |
| | 0.841 | 0.029 | 28.658 | | | 1.000 | 0.000*** |
| EO ->Recon | | | | 0.316 | [0.632,0.768] | | |
| | 0.691 | 0.034 | 20.453 | | | 1.000 | 0.000*** |
| EO -> RR | | | | 0.412 | [0.773, 0.877] | | |
| | 0.766 | 0.026 | 31.382 | | | 1.000 | 0.000*** |
| EO -> Seiz | | | | 0.381 | [0.587,0.770] | | |
| | 0.662 | 0.046 | 14.722 | | | 1.000 | 0.000*** |
| EO -> Sen | | | | 0.345 | [0.713, 0.825] | | |
| | 0.765 | 0.029 | 26.847 | | | 1.000 | 0.000*** |
| EO -> SI | | | 26.296 | 0.096 | [0.655, 0.761] | | |
| | 0.713 | 0.027 | | | | 4.556 | 0.000*** |
| RB -> SI | | | 0.348 | 0.031 | [0.017, 0.212] | | |
| | 0.016 | 0.051 | | | | 1.472 | 0.728 |
| RC -> SI | | | | 0.158 | [0.177, 0.498] | | |
| | 0.256 | 0.082 | 4.225 | | | 3.398 | 0.002*** |
| Reconf -> SI | | | | 0.147 | [0.309, 0.528] | | |
| | 0.359 | 0.057 | 7.395 | | | 3.072 | 0.000*** |
| RR -> SI | 0.203 | 0.078 | 4.470 | 0.120 | [0.194, 0.499] | 2.826 | 0.001*** |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Seiz -> SI | | | | 0.001 | [-0.077, 0.234] | | |
| | 0.074 | 0.081 | 0.819 | | | 2.987 | 0.413 |
| Sen -> SI | | | | 0.019 | [-0.030, 0.267] | | |
| | 0.045 | 0.075 | 1.544 | | | 4.053 | 0.123 |

| **Quality criteria** | | | **Predictive Relevance, $Q^2$ (= 1-SSE/SSO** |
|---|---|---|---|
| | **R-square** | **Adjusted R-square** | |
| Reconf | 0.478 | 0.476 | 0.490 |
| RB | 0.484 | 0.482 | 0.411 |
| RC | 0.707 | 0.706 | 0.709 |
| RR | 0.652 | 0.651 | 0.688 |
| SI | 0.662 | 0.653 | 0.461 |
| Seiz | 0.439 | 0.436 | 0.457 |
| Sen | 0.584 | 0.583 | 0.588 |

*Note: EO= environmental orientation, RB= resilience behaviour, RR= resilience resource, RC= resilience capabilities, Sen = sensing, Seiz = seizing, Recon = reconfiguration, SI= sustainable innovation, CI= confidence interval, SD= standard deviation, $f^2$ = f-square (effect size)*

*p < 0.05.**p < 0.01.***p < 0.001.

*(Source: Author's own, 2025)*

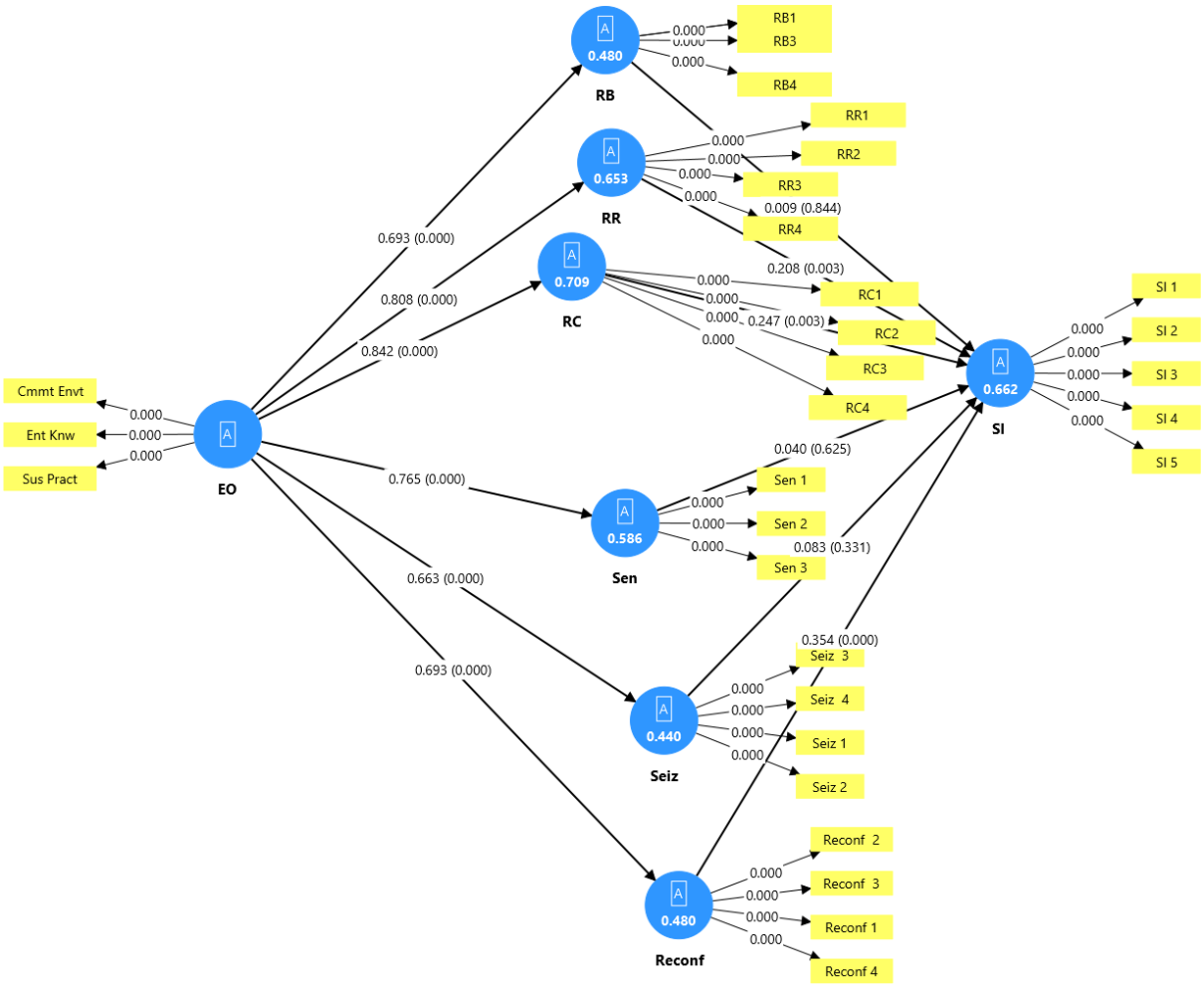



*Fig. 4.1: Pathway assessments*

*Note: EO= environmental orientation, RB= resilience behaviour, RR= resilience resource, RC= resilience capabilities, Sen = sensing, Seiz = seizing, Recon = reconfiguration, SI= sustainable innovation,*

*(Source: Author's own, 2025)*

Results in Figure 4.1 suggest that, except for three of the pathways (i.e., RB→SI, Seiz→SI and Sen→SI), all the pathways report a statistically significant relationship at a significant level of $p<0.001$. Concerning the relationship between environmental orientation and organisational resilience, the results in Table 4.5 reveal that environmental orientation had a significant relationship with resilience behaviour ($\beta=0.695$, $p<0.001$). Similarly, environmental orientation had a significant relationship with resilience capability and resilience resource ($\beta=0.841$, $p<0.001$) and resilience resource, respectively ($\beta=0.765$, $p<0.01$). Also, with the relationship between environmental orientation and dynamic capability (sensing, seizing and reconfiguration), environmental orientation reported a significant relationship with sensing ($\beta=0.765$, $p<0.001$),

seizing (β=0.662, p<0.001), and reconfiguration (β=0.691, p<0.001). Furthermore, environmental orientation reported a significant positive relationship with SMEs' sustainable innovation (β=0.713, p<0.001). Hypothesis 1, therefore, gains support from the study sample.

Additionally, with the direct relationship between organisational resilience (i.e., behaviour, resource and capability) and sustainable innovation, resilience resource (β=0.203, p<0.001) and resilience capability reported a significant positive relationship with SMEs' sustainable innovation (β=0.256, p<0.001). In contrast, resilience behaviour reports an insignificant relationship with sustainable innovation (β=0.016, p>0.05). Further, with the relationship between dynamic capability (sensing, seizing and reconfiguration) and SMEs' sustainable innovation, results in Table 4.5 reveal that whereas reconfiguration (β=0.359, p<0.01) reports a significant relationship with sustainable innovation, sensing (β=0.045, p>0.05) and seizing (β=0.074, p>0.05) report an insignificant relationship with SMEs sustainable innovation.

With the model's effect size estimates, the $f^2$ of the endogenous variables ranged from 0.001 to 0.412, signifying a small to large effect size (Cohen, 1988). The $R^2$ values of the endogenous variable were above 10%, suggesting that the explanatory power of the independent variables on the dependent variable was sufficient (Falk & Miller, 1992). Results in Table 4.6 indicate that resilience behaviour recorded an $R^2$ of 0.484, resilience resource obtained an $R^2$ value of 0.652, resilience capability received an $R^2$ of 0.707, sensing received an $R^2$ value of 0.584, seizing received an $R^2$ value of 0.439 and reconfiguration, on the other hand, recorded an $R^2$ value of 0.478. Lastly, with the outer model, results for the tolerance value and variance inflation factor (VIF) for the outer model were within the recommended thresholds, that is, tolerance value > 0.1 and VIF < 5 (Roberts & Thatcher, 2009), suggesting that issues of multicollinearity are not a serious issue to be concerned with in the outer model assessment.

### 4.4.2 Mediation analysis

First, to proceed with the mediation analysis for H2, H3, H4, H5, H6 and H7, Baron and Kenny's (1986) three-step mediation procedure was used. Baron and Kenny (1986) indicated that mediation is achieved when the bootstrapping results' 95% confidence interval (CI) does not contain zero. Following the suggestions of Baron and Kenny (1986), first, our study explored the direct effect of the explanatory variable (environmental orientation) on the endogenous (i.e., sustainable innovation). Subsequently, the effect of the explanatory variable (environmental orientation) on the mediating variables (resilience behaviour, resilience resource and resilience capability) and dynamic capability (sensing, seizing and reconfiguration) was tested. Lastly, the effect of the mediating variables on the dependent variable was examined. Full mediation is achieved when the second and third relationships are significant, whereas the direct

relationship between the predictive and dependent variables is insignificant. However, partial mediation is achieved when all three relationships are statistically significant (Chen & Nadkarni, 2017). The results from the mediation analysis are presented in Table 4.7.

Table 4.7 Results of the mediation test by the bootstrapping approach

| Indirect effects | Coeff (β) | 97.5% CI | P values | Conclusion |
|---|---|---|---|---|
| **Hypothesised path** | | | | |
| EO→Sen→SI | 0.035 | [-0.023, 0.208] | 0.126 | H2 not supported |
| EO→Seiz→SI | 0.049 | [-0.023, 0.208] | 0.426 | H3 not supported |
| EO→Recon→SI | 0.248 | [0.216, 0.379] | 0.000*** | H4 supported |
| EO→RB→SI | 0.011 | [-0.051, 0.075] | 0.728 | H5 not supported |
| EO→RR→SI | 0.291 | [0.160, 0.413] | 0.000*** | H6 supported |
| EO→RC→SI | 0.292 | [0.151, 0.417] | 0.000*** | H7 supported |

*Note: EO= environmental orientation, RB= resilience behaviour, RR= resilience resource, RC= resilience capabilities, Sen = sensing, Seiz = seizing, Recon = reconfiguration, SI= sustainable innovation, CI= confidence interval*

*p < 0.05.**p < 0.01.***p < 0.001.

*(Source: Author's own, 2025)*

Hypothesis 2 posited that sensing mediated the relationship between environmental orientation and sustainable innovation. The results in Table 4.7 could not confirm this hypothesis as sensing reported an insignificant mediation effect (β=0.035; p>0.05, CI [-0.023, 0.208]). With Hypothesis 3, results from Table 4.7 posited that seizing did not mediate the relationship between environmental orientation and sustainable innovation (β=0.049; p>0.05, CI [-0.023, 0.208]). Therefore, hypothesis 3 failed to gain support from the study sample. With hypothesis 4, results from Table 4.7 revealed that reconfiguration mediated the relationship between environmental orientation and sustainable innovation (β=0.248; p<0.001, CI [0.216, 0.379]). Hypothesis 5 underscored that resilience behaviour mediates the relationship between environmental orientation and sustainable innovation. The results in Table 4.6 suggest that resilience behaviour did not mediate this relationship (β=0.011; p < 0.05, CI [[-0.051, 0.075]). With hypothesis 6 and hypothesis 7, results from Table 4.7 suggest that resilience resource (β=0.291; p<0.001, CI [0.160, 0.413]) and resilience capability (β=0.292; p<0.001, CI [0.151, 0.417]) mediated the relationship between environmental orientation and sustainable orientation. Guided by the recommendation of Baron and Kenny (1986), these interaction effects were assessed along the three parameters to establish whether this mediation is full or

partial. Per the parameters set earlier, the interactive effect between organisational resilience and dynamic capability can be concluded as partial mediation, since environmental orientation first reported a significant positive relationship with the endogenous variable (sustainable innovation) and the boundary variables.

Table 4.8 Summary of tested hypotheses

| | Hypothesis | Conclusion |
|---|---|---|
| H1 | Environmental orientation positively affects sustainable innovation. | *Fail to reject* |
| H2 | Sensing capability mediates the relationship between environmental orientation and sustainable innovation. | *Reject* |
| H3 | Seizing capability mediates the relationship between environmental orientation and sustainable innovation. | *Reject* |
| H4 | Reconfiguration capability mediates the relationship between environmental orientation and sustainable innovation. | *Fail to reject* |
| H5 | Resilience behaviour mediates the relationship between environmental orientation and sustainable innovation. | *Reject* |
| H6 | Resilience resources mediate the relationship between environmental orientation and sustainable innovation. | *Fail to reject* |
| H7 | Resilience capability mediates the relationship between environmental orientation and sustainable innovation. | *Fail to reject* |
| H8 | Different configurations will produce SMEs' sustainable innovation | *Fail to reject* |

*(Source: Author's own, 2025)*

### 4.4.3 Explanatory power assessment of the proposed model

Traditional assessment parameters, namely $R^2$, $f^2$ and $Q^{2,}$ are used to assess the predictive power of proposed models, especially for in-sample model estimations.

However, with time, emerging evidence has confirmed the inadequacy of these conventional assessment criteria because of issues such as estimated model overfit and a statistical error where the model tends to connect its training data exactly to the point where it becomes impossible to forecast imminent conditions correctly. Therefore, due to the inadequacies of the $R^2$, $f^2$ and $Q^2$ assessment criteria, new methods have been proposed based on out-of-sample estimations (Hair & Sarstedt, 2021). The out-of-sample estimation seeks to validate the model based on a new dataset. Therefore, with the out-of-sample estimation, the data is split into training and testing, and the model's predictive power is concurrently assessed on the split dataset through cross-validation (Shmueli et al., 2019). However, with SmartPLS, all data splitting and cross-validation processes are done simultaneously. Therefore, from the outputs of the SmartPLS, two models are generated, the linear regression model (LM) and the PLS-SEM model (PLS) (Shmueli et al., 2019).

The out-of-sample assessment uses the root mean square error (RMSE) and mean absolute error (MAE) estimates. Generally, four outcomes, high, medium, low and no predictive power, are generated when the RMSE and MAE generated from the linear regression model are juxtaposed with the PLS outputs (Hair et al., 2019; Shmueli et al., 2019). To achieve a high explanatory power, the RMSE or MAE values for all the constructs of the endogenous variables in LM should be higher than those of the PLS RMSE or MAE values. A medium predictive power, on the other hand, is achieved when the RMSE or MAE scores for a few of the indicators of the endogenous constructs in PLS are less than the corresponding values in the LM. In contrast, a lower explanatory power is achieved when most of the RMSE or MAE scores for many of the endogenous constructs in PLS are higher than the related errors in LM. Lastly, no predictive power is produced when the RMSE or MAE estimates for all values of the endogenous construct in the PLS are higher than the related errors in the LM. The results of the predictive power of the model are presented in Table 4.9. The results in Table 4.9 underscore that not all but some of the RMSE or MAE values of the endogenous indicators of the LM are higher than the PLS RMSE or MAE indicators, suggesting a low predictive power.

Table 4.9 Explanatory power assessment of the proposed model

| Construct | Items | $Q^2$predict | PLS-SEM_RMSE | PLS SEM_MAE | LM_RMSE | LM_MAE |
|---|---|---|---|---|---|---|
| **Resilience behaviour** | **RB1** | 0.253 | 0.775 | 0.605 | 0.248 | 0.104 |
| | **RB2** | 0.219 | 0.817 | 0.625 | 0.312 | 0.148 |
| | **RB3** | 0.230 | 0.821 | 0.631 | 0.305 | 0.144 |
| | **RB4** | 0.273 | 0.816 | 0.599 | 0.401 | 0.183 |
| **Resilience capability** | **RC1** | 0.549 | 0.847 | 0.633 | 0.559 | 0.282 |
| | **RC2** | 0.543 | 0.794 | 0.615 | 0.541 | 0.273 |
| | **RC3** | 0.522 | 0.891 | 0.681 | 0.669 | 0.360 |
| | **RC4** | 0.547 | 0.830 | 0.652 | 0.606 | 0.297 |
| **Resilience resource** | **RR1** | 0.440 | 0.984 | 0.770 | 0.497 | 0.233 |
| | **RR2** | 0.486 | 0.954 | 0.751 | 0.625 | 0.317 |
| | **RR3** | 0.394 | 1.170 | 0.951 | 0.605 | 0.318 |
| | **RR4** | 0.510 | 0.938 | 0.737 | 0.649 | 0.313 |
| **Reconfiguration** | **Reconf 1** | 0.282 | 0.825 | 0.672 | **0.848** | **0.697** |
| | **Reconf 2** | 0.369 | 0.888 | 0.716 | 0.881 | 0.712 |
| | **Reconf 3** | 0.410 | 0.961 | 0.775 | 0.914 | 0.711 |
| | **Reconf 4** | 0.436 | 0.861 | 0.704 | 0.847 | 0.670 |
| **Seizing** | **Seiz 1** | 0.286 | 0.969 | 0.712 | **0.971** | **0.744** |
| | **Seiz 2** | 0.336 | 0.908 | 0.693 | 0.856 | 0.653 |
| | **Seiz 3** | 0.304 | 1.037 | 0.795 | **1.047** | **0.818** |
| | **Seiz 4** | 0.398 | 0.962 | 0.748 | 0.985 | 0.744 |

| | | | | | | |
|---|---|---|---|---|---|---|
| **Sensing** | **Sen 1** | 0.345 | 0.895 | 0.714 | 0.852 | 0.665 |
| | **Sen 2** | 0.356 | 0.919 | 0.704 | 0.889 | 0.696 |
| | **Sen 3** | 0.541 | 0.805 | 0.623 | 0.803 | 0.602 |
| **Sustainable innovation** | | | | | | |
| | **SI R1** | 0.319 | 1.058 | 0.845 | **1.085** | **0.850** |
| | **SI R2** | 0.156 | 1.207 | 0.980 | **1.193** | **0.984** |
| | **SI R3** | 0.205 | 1.221 | 0.994 | 1.190 | **0.966** |
| | **SI R4** | 0.400 | 1.063 | 0.851 | **1.081** | **0.868** |
| | **SI R5** | 0.143 | 1.347 | 1.113 | **1.347** | **1.128** |
| | **SI R6** | 0.319 | 1.117 | 0.896 | **1.158** | **0.906** |

*Note: RB= resilience behaviour, RR= resilience resource, RC= resilience capabilities, Sen = sensing, Seiz = seizing, Recon = reconfiguration, SI= sustainable innovation, CI= confidence interval*

*(Source: Author's own, 2025)*

# 5. CONFIGURATIONAL ANALYSIS OF ENVIRONMENTAL ORIENTATION OUTCOMES ON SMES

## 5.1 Introduction

Considering that the analysis done on symmetric and net effects estimation tends not to produce the whole truth, since the observed net effects in such analysis do not apply to all cases in a dataset (Woodside, 2014; Asante et al., 2025), a qualitative comparative analysis was computed (QCA) using the same dataset used for the relationship analysis. With the QCA, the fuzzy set qualitative comparative analysis (fsQCA) was used, and it involves three processes: data calibration, truth tabulation, and counterfactual analyses (Olya et al., 2020). The three processes are presented in the sub-sections under this chapter.

## 5.2 Data calibration

First, the fuzzy set qualitative comparative analysis (fsQCA) calibrated the latent and composite scores obtained from the Smart-PLS. Following the procedure of the extant literature, the latent and composite scores were calibrated into three set of membership: a score of 5 indicated full membership with a corresponding calibrated value of 1, a score of 4 suggested a crossover point with a calibrated value of 0.50, and a score of 1 was specified as full non-membership with a calibrated value of 0 (Manosuthi et al., 2022; Asante et al., 2025). Though adequate prior knowledge has been suggested to be helpful for the data calibration (Ragin, 2008), emerging evidence has indicated that in the absence of a theoretical familiarity, the percentile function in the Statistical Packages for Social Sciences (SPSS) (frequencies → statistics → percentiles) can be used to adequately calibrate the data along the three thresholds (De Crescenzo et al., 2020; Pappas & Woodside, 2021). The membership values employed on each construct based on the established points are presented in Table 5.1.

Table 5.1 Data calibration membership cut-off points

| Construct | Full non-membership score | Crossover point | Full membership score |
|---|---|---|---|
| RB | 1.00 | 4.00 | 5.00 |
| RC | 2.00 | 4.00 | 5.00 |
| RR | 2.00 | 4.00 | 5.00 |
| SI | 2.00 | 4.00 | 5.00 |
| Seiz | 1.00 | 4.00 | 5.00 |
| Sen | 1.00 | 4.00 | 5.00 |
| Reconf | 2.00 | 4.00 | 5.00 |

| | | | |
|---|---|---|---|
| EO | 1.00 | 4.00 | 5.00 |

*Note: EO= environmental orientation, RB= resilience behaviour, RR= resilience resource, RC= resilience capabilities, Sen = sensing, Seiz = seizing, Recon = reconfiguration, SI= sustainable innovation*

*(Source: Author's own, 2025)*

## 5.3 Truth table

The truth table constitutes all the plausible elements explaining a consequence (i.e., sustainable innovation). Next, the truth table was reduced for conditions that predicted a better consequence by setting the frequency cut-off at >2 (Ragin, 2008; Pappas & Woodside, 2021). Following the suggestion of the extant, all rows with no cases were eliminated (Ragin 2008; Pappas & Woodside, 2021). Also, the raw consistency and proportional reduction inconsistency (PRI) scores were set at 0.80 to ensure that the sufficient and necessary recipes demonstrate a satisfactory validity (Ragin, 2008). The consistency index is analogous to the correlation, and the coverage index is also equivalent to the R-squared value in structural equation modelling and multiple regression in symmetrical analysis (Fang et al., 2016). The result generated from the truth table, highlighting the conditions that explain the presence and the negation of sustainable innovation, is presented in Tables 5.2 and 5.3, respectively.

Table 5.2 Truth Table for the configurations explaining the presence of Sustainable Innovation

| EO | RB | RR | RC | Sen | Seiz | Reconf | number | SI | raw consist. | PRI consist. | SYM consist |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0 | 1 | 1 | 1 | 1 | 1 | 18 | 1 | 0.964598 | 0.754336 | 0.754335 |
| 1 | 0 | 0 | 1 | 1 | 1 | 1 | 2 | 1 | 0.956778 | 0.586855 | 0.586854 |
| 1 | 1 | 0 | 1 | 1 | 1 | 1 | 2 | 1 | 0.953221 | 0.718244 | 0.735225 |
| 1 | 1 | 1 | 1 | 1 | 1 | 1 | 26 | 1 | 0.951944 | 0.889217 | 0.93237 |
| 1 | 1 | 1 | 0 | 1 | 1 | 1 | 6 | 1 | 0.951201 | 0.68523 | 0.68523 |
| 1 | 0 | 0 | 1 | 1 | 0 | 1 | 4 | 1 | 0.950828 | 0.387094 | 0.387095 |
| 1 | 0 | 1 | 0 | 1 | 1 | 1 | 5 | 1 | 0.949137 | 0.426314 | 0.445054 |
| 1 | 1 | 1 | 0 | 0 | 0 | 1 | 4 | 1 | 0.933894 | 0.460784 | 0.465347 |
| 1 | 1 | 1 | 1 | 1 | 1 | 0 | 4 | 1 | 0.931144 | 0.578834 | 0.590309 |
| 1 | 1 | 0 | 1 | 1 | 0 | 0 | 15 | 1 | 0.904743 | 0.39323 | 0.39323 |
| 1 | 1 | 0 | 1 | 0 | 1 | 0 | 10 | 1 | 0.903893 | 0.339833 | 0.343662 |
| 1 | 1 | 0 | 0 | 0 | 0 | 1 | 4 | 1 | 0.903082 | 0.315185 | 0.32258 |
| 1 | 0 | 0 | 0 | 0 | 0 | 1 | 4 | 1 | 0.90197 | 0.274576 | 0.274576 |
| 1 | 1 | 1 | 1 | 0 | 0 | 0 | 2 | 1 | 0.900967 | 0.467742 | 0.47112 |
| 1 | 0 | 0 | 0 | 1 | 1 | 1 | 12 | 1 | 0.867502 | 0.214854 | 0.214854 |
| 1 | 1 | 1 | 0 | 0 | 0 | 0 | 3 | 1 | 0.842823 | 0.222597 | 0.222597 |
| 1 | 0 | 0 | 0 | 0 | 1 | 0 | 8 | 1 | 0.840175 | 0.100737 | 0.100737 |
| 1 | 0 | 1 | 0 | 0 | 0 | 0 | 2 | 1 | 0.838295 | 0.0945947 | 0.0963304 |
| 1 | 1 | 0 | 0 | 0 | 1 | 0 | 8 | 1 | 0.830175 | 0.179533 | 0.179533 |
| 1 | 1 | 0 | 0 | 0 | 0 | 0 | 6 | 0 | 0.707993 | 0.112588 | 0.112888 |
| 1 | 0 | 0 | 0 | 0 | 0 | 0 | 17 | 0 | 0.597182 | 0.0377744 | 0.0377744 |

*Note: EO= environmental orientation, RB= resilience behaviour, RR= resilience resource, RC= resilience capabilities, Sen = sensing, Seiz = seizing, Recon = reconfiguration, SI= sustainable innovation*

*(Source: Author's own, 2025)*

Table 5.3 Truth Table for the configurations explaining the negation of Sustainable Innovation

| SO | RB | RR | RC | Sen | Seiz | Reconf | number | ~SI | raw consist. | PRI consist. | SYM consist |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0 | 0 | 0 | 0 | 0 | 0 | 17 | 1 | 0.984186 | 0.962225 | 0.962226 |
| 1 | 0 | 0 | 0 | 0 | 1 | 0 | 2 | 1 | 0.982096 | 0.899263 | 0.899263 |
| 1 | 0 | 1 | 0 | 0 | 0 | 0 | 2 | 1 | 0.979887 | 0.887387 | 0.90367 |
| 1 | 0 | 0 | 0 | 1 | 1 | 1 | 3 | 1 | 0.963742 | 0.785146 | 0.785146 |
| 1 | 1 | 0 | 0 | 0 | 0 | 0 | 6 | 1 | 0.962077 | 0.884752 | 0.887112 |
| 1 | 0 | 0 | 1 | 1 | 1 | 1 | 2 | 1 | 0.938605 | 0.413147 | 0.413146 |
| 1 | 1 | 1 | 1 | 0 | 0 | 0 | 2 | 1 | 0.911637 | 0.525089 | 0.52888 |
| 1 | 1 | 0 | 1 | 1 | 1 | 1 | 2 | 1 | 0.876917 | 0.258659 | 0.264775 |
| 1 | 1 | 1 | 1 | 1 | 1 | 1 | 26 | 0 | 0.59419 | 0.0645002 | 0.0676303 |

*Note: EO= environmental orientation, RB= resilience behaviour, RR= resilience resource, RC= resilience capabilities, Sen = sensing, Seiz = seizing, Recon = reconfiguration, SI= sustainable innovation*

*(Source: Author's own, 2025)*

### 5.4 The necessary condition analysis (NCA)

Before exploring the sufficient condition analysis, the necessary condition analysis (NCA) was examined to identify whether any of the constructs could, on their own, predict the endogenous construct (i.e., sustainable innovation). Results from Table 5.4 revealed that out of the seven constructs causing SMEs' sustainable innovation, resilience behaviour constituted the only antecedent that independently predicted sustainable innovation, since its consistency value was higher than 0.9. In contrast, none of the six remaining constructs (i.e., resilience resource, resilience capability, sensing, seizing, reconfiguration and environmental orientation) independently caused SMEs' sustainable innovation as all their consistency values were less than 0.9 (Pappas & Woodside, 2021). Similarly, none of the negation antecedents adequately caused SMEs' sustainable innovation outcomes, as all their consistency values were less than 0.9.

Table 5.4 Necessary condition analysis for SI outcomes

| Configurations | Consistency | Coverage |
|---|---|---|
| RB | 0.907 | 0.705 |
| RR | 0.833 | 0.795 |
| RC | 0.864 | 0.825 |
| Sen | 0.846 | 0.810 |
| Seiz | 0.847 | 0.815 |
| Reconf | 0.834 | 0.822 |
| EO | 0.877 | 0.790 |
| ~RB | 0.469 | 0.624 |
| ~RR | 0.532 | 0.538 |
| ~RC | 0.529 | 0.534 |
| ~Sen | 0.555 | 0.559 |
| ~Seiz | 0.564 | 0.565 |
| ~Reconf | 0.522 | 0.511 |
| ~EO | 0.551 | 0.790 |

*Note: EO environmental orientation, RB= resilience behaviour, RR= resilience resource, RC= resilience capabilities, Sen = sensing, Seiz = seizing, Recon = reconfiguration, SI= sustainable innovation*

*(Source: Author's own, 2025)*

~Indicates the absence of a condition.

### 5.5 Sufficient condition analysis (SCA) and its predictive power

Further, to identify the configurations of recipes that explained SMEs' sustainable innovation, the sufficient condition analysis (SCA) was computed. However, to begin with, SCA, the truth table containing all the possible configurations, was first computed. With the truth table, the frequency was set at two, allowing us to eliminate every irrelevant configuration, resulting in an 80 per cent value (Ragin, 2008). After setting these criteria (i.e., frequency cutoff at two and consistency cutoff of 0.8), three solutions were produced under the Quine-McCluskey algorithm: complex, parsimonious, and intermediate. Out of these algorithm solutions, the recipes from the intermediate solution were used for the qualitative comparative analysis because their outcomes minimise the truth table after adding all the unobserved cases that the theory argues to produce an outcome (Fiss, 2011). Therefore, because of its validity over the other solutions, it became the primary source of the fsQCA (Rihoux & Ragin, 2009).

Table 5.5 Sufficient condition analysis

| **Configurations for the presence of SI** | **Raw coverage** | **Unique coverage** | **Consistency** |
|---|---|---|---|
| ***SI = f (RB, RR, RC, Sen, Seiz, Reconf, EO)*** | | | |
| EO*~RB*Sen*Seiz * ~RC | 0.364 | 0.008 | 0.892 |
| ~EO*RB*RR~*Sen*~Seiz*Reconf | 0.354 | 0.033 | 0.903 |
| EO*RB*RC*Seiz*Reconf | 0.628 | 0.316 | 0.952 |
| EO*~RB*~RR*~RC*Sen*Seiz*Reconf | 0.271 | 0.011 | 0.875 |
| Solution coverage: 0.741 | | | |
| Solution consistency: 0.858 | | | |
| ***Configurations for the absence of SI*** | **Raw coverage** | **Unique coverage** | **Consistency** |
| ***~SI = f (RB, RR, RC, Sen, Seiz, Reconf, EO)*** | | | |
| ~EO*~RR*~RC*~Sen | 0.568 | 0.058 | 0.973 |
| EO*~RB*RR*~Sen*~Seiz*~Reconf | 0.325 | 0.009 | 0.986 |
| ~EO*RB*RR*RC*~Sen*~Seiz*~Reconf | 0.352 | 0.019 | 0.933 |
| EO*~RB*~RR*~RC*Sen*Seiz*Reconf | 0.292 | 0.044 | 0.976 |
| Solution coverage: 0.676 | | | |
| Solution consistency: 0.945 | | | |

*Note: EO= environmental orientation, RB= resilience behaviour, RR= resilience resource, RC= resilience capabilities, Sen = sensing, Seiz = seizing, Recon = reconfiguration, SI= sustainable innovation*

** – logical conjunction AND, ~ – negation or absence*

*(Source: Author's own, 2025)*

With the first configurations, the results in Table 5.5 reveal that the presence of environmental orientation, absence of resilience behaviour, the presence of sensing and seizing and the absence of reconfiguration predicted SMEs' sustainable innovation (EO*~RB*Sen*Seiz*~RC). This configuration reported a raw coverage of 0.364 and consistency of 0.892. The coverage of 0.364, equivalent to the R-square value in structural equation modelling, suggests that 36.4% of SMEs' sustainable innovation outcomes can be explained by the combinations of the presence of environmental orientation, sensing and seizing and the negation of resilience behaviour and reconfiguration.

With **solution 2**, results from Table 5.5 indicate that the absence of environmental orientation, the presence of resilience behaviour, resilience resource and reconfiguration and the absence of sensing and seizing caused SMEs' sustainable innovation outcomes (~EO*RB*RR*~Sen*~Seiz*Reconf). The raw coverage and the consistency values for this second configuration stood at 0.354 and 0.903, respectively. This result, though different from the configurations of the first solutions, suggests that the recipes of organisational resilience attributes (i.e., resilience behaviour and resilience resource) and dynamic capability antecedents (i.e., reconfiguration) collectively explained SMEs' sustainable innovation outcomes.

With **solution 3**, results from Table 5.5 suggest that SMEs' sustainable innovation outcomes came out of the configurations of the presence of environmental orientation, resilience behaviour, resilience capability, seizing and reconfiguration (EO*RB*RC*Seiz*Reconf). The raw coverage and the consistency for the third configuration were 0.628 and 0.952, respectively. The results on the third configuration imply that the presence of environmental orientation, dynamic capability attributes (i.e., seizing and reconfiguration) and organisational resilience antecedents (i.e., resilience behaviour and resilience capability) remain essential to predicting SMEs' sustainable innovation consequence.

Lastly, with the fourth configuration, results from Table 5.5 suggest that the recipes that accounted for SMEs' sustainable innovation outcomes came from the presence of environmental orientation, sensing, seizing, reconfiguration and the negation of resilience behaviour, resilience resource and resilience capability (EO*~RB*~RR*~RC*Sen*Seiz*Reconf). The raw coverage and the consistency

for the fourth configuration were 0.271 and 0.875, respectively. The results of the configurations imply that both the presence of environmental orientation and the presence of dynamic capability attributes (i.e., sensing, seizing and reconfiguration) remain crucial to SMEs' sustainable innovation consequence. From these four configurations, it was evident that four of the constructs, environment orientation (existed in solution, 1, 3 and 4), sensing (existed in solution 1, 2 and 4), seizing (existed in solution 1, 3 and 4) and reconfiguration (existed in solution 2, 3, 4) existed in three of solutions indicating their crucial role in SMEs' sustainable innovation outcomes. On the other hand, the presence of resilience behaviour existed in only two configurations (solutions 2 and 3). In contrast, resilience resources and capability existed in only one solution (i.e., solutions 2 and 3, respectively), confirming its significant impact on SMEs' sustainable innovation performance.

Therefore, it can be argued that environmental orientation, sensing, seizing, and reconfiguration had the most significant impact out of the seven constructs due to their presence in three of the solutions, followed by resilience behaviour, with its presence in two solutions, and resilience resource and resilience capability had the minimal impact, with their presence in one solution. The results from the fsQCA add more dimensions to the Smart-PLS results. Notably, different from the symmetrical analysis, where sensing and seizing reported no mediation effect in the environmental orientation and SMEs' sustainable innovation relationship, sensing and seizing had a vital impact on SMEs' sustainable innovation outcomes in the asymmetrical result, as its presence was evident in three of the four configurations that caused SMEs' sustainable innovation consequences. Again, whereas resilience behaviour, resilience resource and resilience capability reported a significant mediating effect in the environmental orientation and sustainable innovation relationship in the Smart-PLS results, with the fsQCA, it was established that the presence of resilience behaviour existed in only two configurations out of the four configurations. Also, resilience resource and capability existed in only one solution, indicating its impact as the least and not substantial, as observed in the Smart-PLS results.

Further, unlike the Smart-PLS analysis, the configurational analysis explored the unequal relationships between the investigated constructs and the outcome of interest, pointing out the diverse configurations that explain an outcome, which is sustainable innovation. Therefore, by using configurational analysis (fsQCA), it complements and extends the findings from symmetric analysis by producing more varied explanations of the different levels of organisational resilience, whose presence is as necessary and sufficient to undergird SMEs' sustainable innovation performance (Woodside, 2014; Pappas et al., 2016). Distinct from the symmetrical analysis, the fsQCA produced configurations that accounted for the absence of SMEs' SI outcomes.

Additionally, four solutions were produced with the configurations that accounted for the negation of SMEs' sustainable innovation. Results in Table 5.5

indicate that the absence of environmental orientation, resilience resource, resilience capability and sensing resulted in the absence of SMEs' sustainable innovation (EO*~RR*~RC*~Sen). The first solution's raw coverage and consistency were 0.568 and 0.973, respectively. With the second configuration, the results in Table 5.5 suggest that the negation of SMEs' sustainable innovation emerged from the presence of environmental orientation, resilience resource and absence of resilience behaviour, sensing, seizing and reconfiguration (EO*~RB*RR*~Sen*~Seiz*~Reconf). The results imply that environmental orientation and resilience resources were insufficient to stimulate SMEs' sustainable innovation outcomes, especially when sensing, seizing, and reconfiguration were negated or absent in the configuration. The second recipe's raw coverage and consistency were 0.325 and 0.986.

Solution 3, results in Table 5.5 suggest that the absence of SMEs' sustainable innovation came from the absence of environmental orientation, sensing, seizing, reconfiguration and presence of resilience behaviour, resilience resource and resilience capability (~EO*RB*RR*RC*~Sen*~Seiz*~Reconf). The results from solution three suggest that the presence of resilience behaviour, resource and resilience capability was inadequate to produce sustainable innovation consequences, especially when the dynamic capability attributes of the SMEs, sensing, seizing, and reconfiguration, are concurrently missing. The raw coverage and the consistency for the third solution were 0.352 and 0.933, respectively.

Lastly, with solution 4, results in Table 5.5 revealed that the absence of resilience behaviour, resilience resource and resilience capability and the presence of environmental orientation, sensing, seizing and reconfiguration resulted in the negation of SME sustainable innovation outcomes (EO*~RB*~RR*~RC*Sen*Seiz*Reconf). Whereas with solution 3, sensing, seizing, and reconfiguration were absent, these dynamic capability attributes became present in solution four. Again, though these dynamic capability attributes were present in the fourth configuration, their presence alone was still insufficient to produce positive SME sustainable innovation outcomes, especially when the antecedents of organisational resilience were absent. The raw coverage and the consistency for the third solution were 0.292 and 0.976, respectively.

With the negation analysis, results from Table 5.5 identified the absence of sensing in three of the four configurations (existed in solutions 1, 2 and 3), suggesting that the absence of these constructs could adversely impede SMEs' sustainable innovation outcomes. However, with the remaining six constructs, environmental orientation (existed in solution 1 and 3), resilience resource (existed in solution 1 and 4), resilience behaviour (existed in solution 2 and 4), resilience capability (existed in solution 1 and 4), seizing (existed in solution 2 and 3) and reconfiguration (existed in solution 2 and 3), its absence became evident in two of the four negation configurations of SMEs sustainable innovation outcomes confirming that their absence reduce the occurrence of sustainable innovation. The fsQCA results, therefore, generated varied solutions confirming

hypothesis 8, which suggests that different configurations will produce SMEs' sustainable innovation. Therefore, results from the study confirm that focusing mainly on symmetric and net effects analysis in the environmental orientation and sustainable innovation relationship may not produce the whole truth, mainly because the observed net effects do not apply to all cases in a dataset (Woodside, 2014).

## 5.6 Equifinality analysis

Further, to validate the model's usefulness, the fsQCA predictability was assessed. Guided by the extant literature, the data, the latent and composite scores analysed from the Smart-PLS, were first randomly divided into two halves (Rasoolimanesh et al., 2021; Asante, 2023; Asante et al., 2025). The first part of the data was then used to estimate the necessary recipes with consistency and coverage set at 0.8 and 0.2, respectively. The results from the first subsample generated three configurations that explained SME sustainable innovation (Table 5.6). The second half of the data was subsequently used to draw an XY plot and to estimate the consistency and coverage for the pull-out outcomes generated from subsample 1. The plot results are presented in Figures 5.1, 5.2 and 5.3, respectively. Results from Figure 5.1 suggest that SMEs' sustainable innovation outcomes emerged from environmental orientation, sensing, seizing, reconfiguration and the absence of resilience behaviour and capability. The configuration, raw coverage, and consistency were 0.676 and 0.923, respectively. Also, in Figure 5.2, the results from the XY plot suggest that SMEs' sustainable innovation came from the presence of environmental orientation, resilience behaviour, resilience resource, sensing, seizing, and the negation of resilience capability and reconfiguration. The second XY plot obtained a raw coverage and consistency of 0.339 and 0.889, respectively. Lastly, in Figure 5.3, the results from the XY plot indicate that the presence of environmental orientation, resilience capability, sensing, seizing, reconfiguration, and the absence of resilience resource predicted SMEs' sustainable innovation outcomes. The third XY plot received a raw coverage and consistency of 0.415 and 0.951, respectively. The results indicate an acceptable consistency and coverage for all the sufficient recipes that predict SMEs' sustainable innovation outcomes from subsample 2, validating the configurations' predictability.

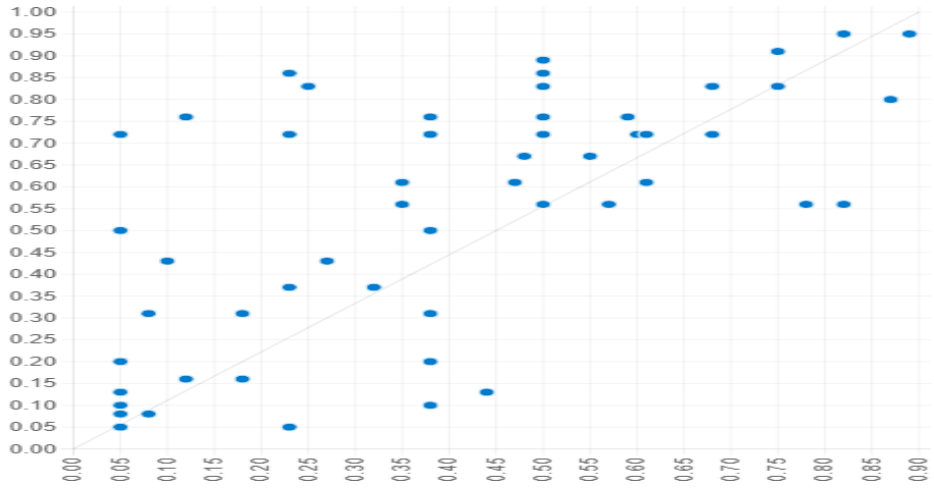
Table 5.6 Testing robustness and predictive power of testing data of SI from subsample 1

| **Configurations for the presence of SI** | **Raw coverage** | **Unique coverage** | **Consistency** |
|---|---|---|---|
| ***SI = f (RB, RR, RC, Sen, Seiz, Reconf, EO)*** | | | |
| EO*~RB*~RC*Sen*Seiz * Reconf | 0.266 | 0.008 | 0.891 |
| EO*RB*RR~*RC*~Sen*Seiz*~Reconf | 0.317 | 0.009 | 0.943 |
| EO*~RR*RC*Sen*Seiz*Reconf | 0.343 | 0.010 | 0.957 |
| Solution coverage: 0.765 | | | |
| Solution consistency: 0.854 | | | |

*Note: EO= environmental orientation, RB= resilience behaviour, RR= resilience resource, RC= resilience capabilities, Sen = sensing, Seiz = seizing, Recon = reconfiguration, SI= sustainable innovation*

** – logical conjunction AND, ~ – negation or absence*

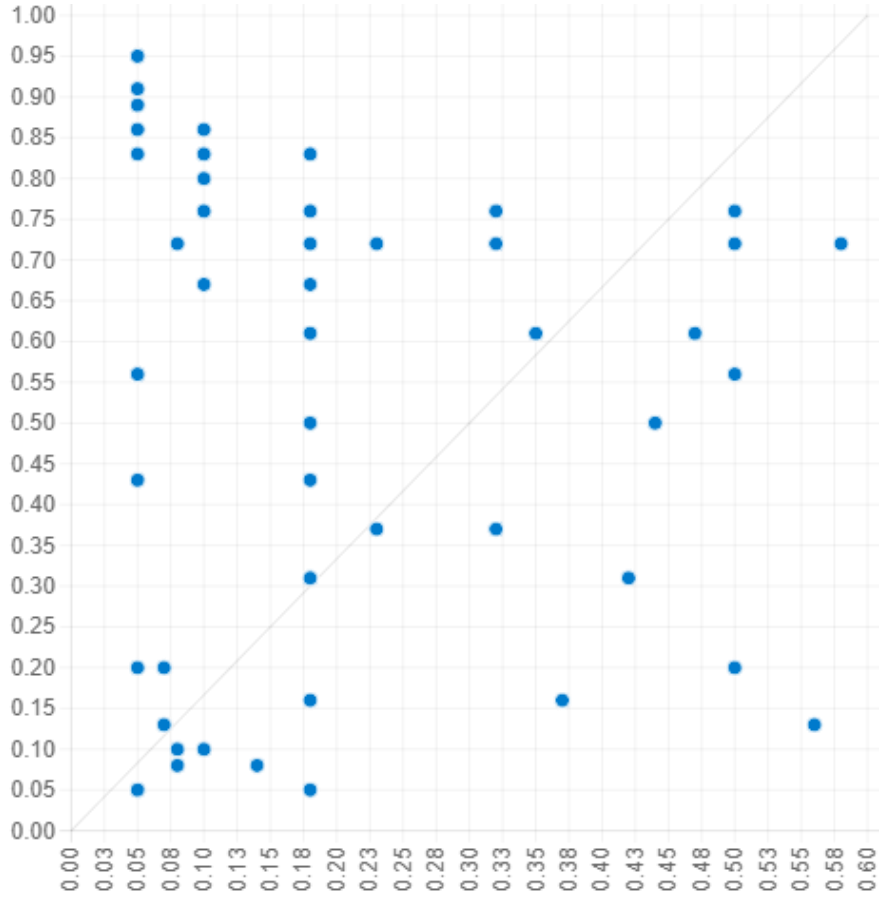
*(Source: Author's own, 2025)*




Consistency: 0.923 Coverage: 0.676

*Fig. 5.1 Configuration for SI (EO*~RB*~RC*Sen*Seiz * Reconf)*

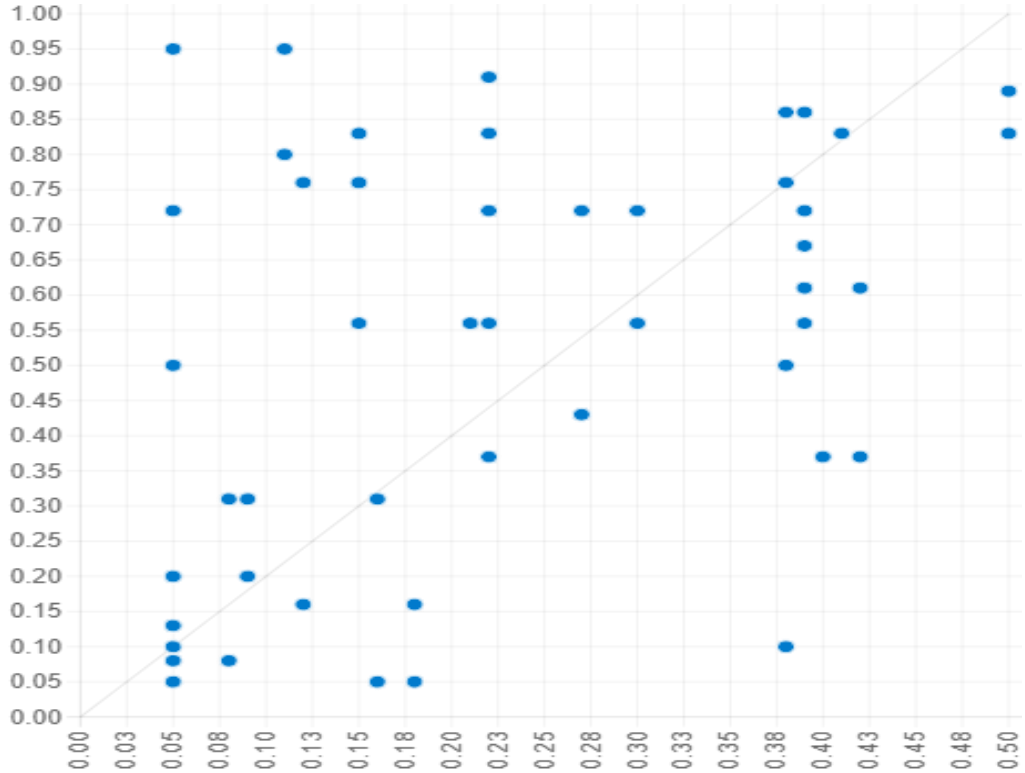
*(Source: Author's own, 2025)*




Consistency: 0.889  Coverage: 0.339

*Fig. 5.2 Configuration for SI (EO*RB*RR~*RC*~Sen*Seiz*~Reconf)*

*(Source: Author's own, 2025)*




Consistency: 0.951 Coverage: 0.415

*Fig. 5.3 Configuration for SI (EO*~RR*RC*Sen*Seiz*Reconf)*

*(Source: Author's own, 2025)*

XY plots for robustness examination of three configurations (based on subsample 2)

*Note: EO= environmental orientation, RB= resilience behaviour, RR= resilience resource, RC= resilience capabilities, Sen = sensing, Seiz = seizing, Recon = reconfiguration, SI= sustainable innovation*

The results reported in Figure 5.1 suggest that the recipes that caused SMEs' sustainable innovation came from the presence of environmental sustainability orientation, sensing, seizing, reconfiguration and the absence of resilience behaviour and capability. Obtaining a consistency and coverage value of 0.923 and 0.676, respectively, confirms the adequacy of the explanatory power of the pull-out sample. In Figure 5.2, the configurations that explain SMEs' sustainable innovation tend to differ from those of the solutions in Figure 5.1. For example, unlike the configurations in Figure 5.1, the solution in Figure 5.2 identified the presence of resilience behaviour, capability, environmental orientation, and seizing as the conditions that caused SMEs' sustainable innovation. Therefore, whereas resilience behaviour and capability were absent in Figure 5.1, they were present in Figure 5.2, indicating the multiplicity of solutions that caused SMEs'

sustainable innovation. Also, in Figure 5.3, the results suggest that SMEs' sustainable innovation came from the presence of environmental orientation, resilience capability, sensing, seizing, reconfiguration, and the absence of resilience resources. It obtained a consistency of 0.951 and coverage of 0.415. Comparatively, along the three solutions generated from the pull-out sample, whereas environmental orientation was present in three solutions, sensing, seizing, and reconfiguration were evident in two solutions, and resilience, resource, and capability were only evident in one of the solutions. The results produced different solutions, confirming the divergence of conditions that account for SMEs' sustainable innovation outcomes.

# 6. DISCUSSION OF FINDINGS AND CONTRIBUTIONS

This chapter discusses the findings of the study. It begins by first highlighting the study's main findings, considering the ten research objectives. The results are further discussed by linking them with the extant literature. The chapter ends with the study findings' contributions to theory and practice.

## 6.1 Discussion of findings

This study investigates the underlying conditions that strengthen the relationship between environmental orientation and SMEs' sustainable innovation. Leveraging on the conservation of resource theory (COR), and the capability theory (DC), the study examined how organisational resilience (behaviour, resource and capacity) and dynamic capability antecedents (sensing, seizing and reconfiguration) become the key conditions required to strengthen SMEs' environmental orientation consequences on sustainable innovation (Leyva-de la Hiz et al., 2019; Tariq et al., 2023). The Smart-PLS analysis confirmed that all the pathways are statistically significant except for three (i.e., RB→SI, Sen→SI and Seiz→SI).

The insignificant relationship between sensing and sustainable innovation can be connected to how the SMEs created and nurtured these firm-level capabilities into their operations. According to Liboni et al. (2023), the consequences of an organisation's environmental orientation will depend on how it can effectively identify the changing needs of its market and stakeholders. This suggests that sensing capability needs to be at the core of a firm's environmental orientation to foster positive innovation outcomes (Pacheco et al., 2018). Also, the insignificant relationship between seizing and sustainable innovation can be hypothetically attributed to how the SMEs developed and supported their seizing capabilities. For instance, from the arguments of Khattab (2017) and Farzaneh et al. (2022), firms that fail to build adequate seizing capabilities often do not see better outcomes from their innovation activities primarily because they do not possess the appropriate in-house competencies to execute the market insight identified during sensing. However, reconfiguration reported a significant relationship with SMEs' sustainable innovation outcomes. Results from the study corroborate the findings of Mousavi et al. (2018), as their study observed that firms with suitable reconfiguring capabilities significantly improved their sustainable innovation outcomes.

Also, though the outcome variable investigated in this study differs from that of Yasir et al. (2020) and Liao et al. (2025), results from the study deepen the conversation surrounding environmental orientation and firm performance, particularly on non-financial outcomes such as sustainable innovation. Results from the study corroborated those of Yasir et al. (2020), as their work reported a

direct positive relationship between environmental orientation and firm environmental performance. In this study, environmental orientation reported a significant positive relationship with sustainable innovation.

Additionally, organisational resilience measured through behaviour, resource and capability impact on SMEs' sustainable innovation was examined. Resilience resource and capability had a statistically significant relationship with sustainable innovation. This result confirms that sustainable innovation requires significant capital investment and often its outcomes are unpredictable; possessing resilient resources becomes crucial in fostering its anticipated effect, especially among SMEs (Berrone et al., 2013). Therefore, in the face of innovation trials, enterprises that have built adequate resources and are willing to make more targeted and timely investments into tools or actions can defuse rising market exposures and consequently achieve better non-financial outcomes (Hendricks et al., 2009).

Although resilient resources may promote eco-friendlier products, preserving them will not produce the expected effect (Bowen, 2002). Therefore, resilience capability, which is manifested only when resources are transformed into action in the organisational setup, solidifies the resilience resource impact on firm outcomes. From the capability-based argument, because resilient capabilities become firm-specific antecedents demonstrated in the organisation's strength (Wernerfelt, 1984) and routines (Obstfeld, 2012), they play a significant role in the reorganising of resources to deal with market uncertainty (Chen, Pan, & Ouyang, 2014). Results from this study confirm those of Farjoun (2010), as their findings posited that resilience minimised organisational failure and decline.

Further, a cardinal insight from our study is the interactive role of organisational resilience in the relationship between environmental orientation and sustainable innovation. From being a mere correlation, resilience behaviour, resource, and capabilities mediated the relationship between environmental orientation and sustainable innovation. These interaction effects were subsequently identified as partial mediation, as environmental orientation first reported a significant relationship with the endogenous variable (sustainable innovation) and the boundary variables. This result confirms the argument that environmental orientation impact may not always be permanently unidimensional because of the differences in market conditions and firm-level characteristics (Adams et al., 2016; Klewitz & Hansen, 2014). Therefore, as sustainable innovation appears unpredictable and more costly than traditional innovations (Berrone et al., 2013), a firm-level attribute or capability becomes necessary to foster SMEs' continuous engagement in eco-innovation endeavours (Leyva-de la Hiz et al., 2019; Tariq et al., 2023). Findings from this study affirm the results of Acquaah et al. (2011) and Marwa and Milner (2013), as in their study, firms with a high level of resilience achieved better organisational performance and competitive advantage.

Further, another key insight from the study findings is moving away from previous narration and measuring dynamic capability as a bundle of variables (i.e., sensing, seizing and reconfiguration) and not as a unidimensional construct (Farzaneh et al., 2022). With the mediating effect of sensing, seizing and reconfiguration in the relationship between environmental orientation and sustainable innovation, findings from the SmartPLS revealed that whereas sensing and seizing had no mediating effect, reconfiguration had a mediating role in the relationship between environmental orientation and sustainable innovation. Investigating the compendium of all the dynamic capability components separately provides a fresh insight, which is more beneficial for SMEs in breaking through the established path dependence with the internal logic of dynamic capability evolution, which is crucial for fostering environmentally friendly innovation and sustainable business growth. Results from the study are consistent with the conclusion of Becker and Dietz (2004), as they posited that considering the complexity of sustainable innovation and SMEs' resource constraints, the impact of environmental orientation on SMEs' sustainable innovation outcomes will be better explained when the proper institutional capabilities are created and fostered. Also, the results from the study corroborate those of Nieves, Quintana, and Osorio (2016) and Singh and Rao (2017). Results from their work revealed that the components of dynamic capability report distinct consequences on firm outcomes, with sensing, seizing and reconfiguration having no underlying consequence on firm innovation outcomes (Nieves et al., 2016), performance (Singh & Rao, 2017) and competitive advantage (Huang et al., 2012). Similarly, sensing and seizing were not directly related to the SMEs' sustainable innovation in this study.

Another notable insight generated from the study is the application of two-method approaches (i.e., Smart-PLS and fsQCA). For example, with the Smart-PLS results, sensing and seizing reported an insignificant relationship in the path and mediation analysis; with the fsQCA, sensing and seizing played a key role in the SMEs' sustainable innovation outcomes. In the configurations that predicted SMEs' sustainable innovation, sensing and seizing were evident in three of the four configurations produced from the sufficient condition analysis. Therefore, though the impact of sensing and seizing in environmental orientation and sustainable innovation was insignificant with the Smart-PLS, the opposite was observed from the fsQCA. Particularly from the fsQCA, sensing and seizing played a quintessential role in the recipes that produced SMEs' sustainable innovation outcomes (i.e., sensing (existed in solution 1, 2 and 4), seizing (existed in solution 1, 3 and 4).

On the other hand, resilience behaviour did not mediate the environmental orientation and sustainable relationship in the symmetrical analysis. With the configuration analysis, resilience behaviour was evident in two of the four configurations that caused SMEs sustainable innovation outcomes. Also, whereas resilience resource and capability reported a significant mediating effect in the

environmental sustainable orientation and sustainable innovation relationship in the Smart-PLS, with the fsQCA, resilience resource and capability existed in only one solution, indicating its impact as minimal and not substantial, as observed in the Smart-PLS results.

Furthermore, distinct from SmartPLS, the fsQCA produced the configurations that accounted for the negation of SMEs' sustainable outcomes. With the negation analysis, findings from the study identified the absence of sensing in three of four negation configurations of SMEs' sustainable innovation, suggesting that the absence of these constructs could negatively impede SMEs' sustainable innovation. However, with the remaining constructs, environmental sustainability orientation, resilience resource, resilience behaviour, resilience capability, seizing and reconfiguration, their absence became evident in two of the four negation configurations, confirming that their absence reduces the occurrence of sustainable innovation. Findings from the fsQCA challenge the implicit assumption that nurturing all the antecedents of dynamic capability would primarily produce better firm performance outcomes (Eisenhardt & Martin, 2000; Barreto, 2010). Specifically, the results from the fsQCA show that their presence may not always produce better firm outcomes and may even restrict sustainable innovation, particularly when their presence is not needed in a given context. For instance, with the four configurations produced to affect SMEs' sustainable innovation consequence, it was revealed that sensing, seizing, and reconfiguration existed in three of the solutions and not in every solution. The results, therefore, corroborate the proposition of Zahra et al. (2006) that dynamic capability antecedents may not always produce the expected outcomes. Findings from the fsQCA corroborated the positions of earlier scholars who have reiterated the inadequacy of symmetrical approaches in accounting for the distinct solutions that constitute adequate and/or necessary conditions for an outcome (i.e., sustainable innovation success or failure, in our case) (Pappas & Woodside, 2021; Asante, 2023; Asante et al., 2025).

## 6.2 Theoretical contributions

This study empirically verified the relationship between environmental orientation and SMEs' sustainable innovation outcomes. Despite the advances in sustainability orientation studies, the extant literature still falls short on how environmental sustainable orientation influences SMEs' sustainable innovation outcomes. Exploring its direct impact on sustainable innovation matters because basing a strategy implementation only on presumptive assumptions without a verified impact may not result in full adoption, especially among SMEs, who may not have a similar amount of resources as larger corporations (Bruhn et al., 2023; Yang & Jiang, 2023). The study is the first to empirically test the direct relationship between environmental orientation and SMEs' sustainable innovation. Results from the study have broadened the breadth of the discourse

on environmental orientation and firm outcomes and consequently confirm the proposition that environmental orientation impact may not consistently drive a homogenous effect (Klewitz & Hansen, 2014; Adams et al., 2016).

Further, by testing the direct relationship between dynamic capability and SMEs' sustainable innovation, the study responds to the clarion call for more studies to empirically verify the relationship between dynamic capability components and firm outcomes (Farzaneh et al., 2022). Often, there is a presumptive assumption that firms that fail to build adequate dynamic capabilities may likely not see better outcomes from their innovation activities, primarily because they do not possess the in-house competencies to deal effectively with market dynamism (Khattab, 2017; Farzaneh et al., 2022). Results from the study address this gap, as with Smart-PLS, reconfiguration constituted the only dynamic capability antecedents which reported a significant relationship with SMEs' sustainable innovation. Interestingly, reconfiguration is a derivative capability anchored on sensing and seizing; hence, its impact should be contingent on the successful completion of sensing and seizing. However, this was not the case in this study, as its direct effect on sustainable innovation was insignificant. A plausible explanation for this phenomenon can be attributed to the characteristics of the study sample, SMEs. As highlighted earlier, most SMEs operating in developing economies have limited access to institutional support, such as credit, human resources and technology (George et al., 2016; Chen & Lee, 2023). Accordingly, to generate adequate value from their limited resource, they are likely to give more emphasis to their reconfiguration capability than the earlier capability components because it constitutes the primary component of strategy implementation and has the greatest potency to produce the expected impact (Pitelis, 2022). This does not presuppose that sensing and seizing are of limited importance among SMEs, as further studies will still be required to validate this claim.

Though some extant studies have measured dynamic capability as the possible boundary conditions predicting firm orientation and innovation outcomes, this area remains disjointed and under-researched both theoretically and empirically, limiting our understanding of how dynamic capability strengthens firm strategy execution and innovation outcomes (Randhawa, Wilden, & Gudergan, 2021). Therefore, by investigating the interactive role dynamic capability antecedents play in SMEs' environmental orientation and sustainable innovation outcomes, the study not only explores how SMEs leverage their dynamic capability to strengthen their sustainable innovation but also provides a deeper insight into which of these internal capabilities produce better sustainable innovation outcomes (Kang et al., 2012; Randhawa et al., 2021). Scholars often explicitly or implicitly assume that the presence of all the components of dynamic capability is required to provide the needed performance boost without providing the empirical basis for such a direct effect. This assumption is challenging, as emerging evidence suggests that the presence of all the dimensions of dynamic

capability (i.e., sensing, seizing and reconfiguration) may not at all times lead to a sustained competitive advantage (Eisenhardt & Martin, 2000; Barreto, 2010), and may even hurt firm performance, especially when their presence is not needed in a given context (Zahra et al., 2006). Results from the study clarify this implicit assumption by underlining that each component of dynamic capability is context dependent, and its expected impact will depend on its role in the organisational setup. For instance, relationship and configurational analysis substantially affected the SMEs' sustainable innovation outcomes more than sensing and seizing.

Additionally, several studies agree on the theoretical distinction between the sub-dimensions of the dynamic capability construct; many have still overlooked the separate effects of each component on firm performance outcomes (Farzaneh et al., 2022). Few studies separately measured the impact of the sub-dimensions of dynamic capability: sensing, seizing, and reconfiguration on the desired outcomes. Therefore, to respond to the call of Pitelis et al. (2024) for studies to concentrate on a specific dimension of dynamic capability and explore its impact on firms' outcomes in depth, this study investigated the impact of all the dynamic capability sub-constructs, sensing, seizing and reconfiguration, distinctly.

Also, by positioning organisational resilience as an interactive antecedent, the study offers novel insights into the boundary conditions reinforcing the relationship between environmental orientation and SMEs' sustainable innovation. While prior studies argued that firms found to be resilient possess more survival traits (Gao et al., 2017) and have more tendencies to re-learn and re-strategise after such unsuccessful attempts (Carmeli & Markman, 2011), studies investigating organisational resilience's impact on SMEs' outcomes remain underexplored (Zhou et al., 2023). The study fills this gap by demonstrating that organisational resilience—activated through behaviour, resource and capabilities— allows SMEs to create the needed capacities and resources to deal effectively with the unexpected endogenous and exogenous challenges that potentially threaten the expectations of their environmental orientation on their firm performance. In addition, although scholars agree on the multi-dimensionality of the organisational resilience concept (Moran, 2016; Linnenluecke, 2017; Hillmann et al., 2021), most studies measured the construct as a single-level construct (e.g., Ray et al., 2011; Ortiz-de-Mandojana & Bansal, 2016; Parker & Ameen, 2018). By assessing the mediating effect of resilience from a three-order construct: resilient behaviour, resource, and capabilities, results from the study confirm the distinctiveness of these three dimensions, each creating unique strategic consequences on firm outcomes.

Also, the investigation of environmental orientation has focused more on developed-country firms and large corporations, offering little or no insights into their impacts on small firms in developing economies (Danso et al., 2019). Therefore, the empirical research presented in this study is based on SMEs in Ghana moving away from the all-too-common WEIRD samples (Western,

Educated, Industrialised, Rich, and Democratic). By investigating environmental orientation in the Ghanaian context, this study moves this construct beyond concentration on the WEIRD samples and large companies, offering context-specific insights to refine and broaden existing theoretical frameworks concerning the consequences of environmental orientation on firm performance architecture. For example, whereas organisational resilience and dynamic capability theories have been expansively investigated in resource-sufficient economies, Ghana's economy, characterised by resource scarcity and unpredictable market conditions, provides insights into how these theories manifest differently. The study findings are grounded in the local context and offer a wider theoretical contribution, which points out alternative paths and mechanisms through which SMEs' environmental orientation and sustainable innovation performance thrive under an uncertain market condition.

Lastly, another significant contribution of the study lies in applying two distinct analytical approaches (i.e., symmetrical and asymmetrical). Earlier studies on environmental orientation and firm performance outcomes have been grounded mainly on symmetric tests and regression-based models, such as multiple regression analysis and structural equation modelling (Menguc & Ozanne, 2005; Yasir et al., 2020; Liao et al., 2025). These methods examine the significance of the effects between two constructs in a model (Pappas et al., 2016). As results from the fsQCA have confirmed, emphasising mainly on symmetric and net effects may not produce the whole truth, mainly because the observed net effects do not apply to all cases in a dataset (Woodside, 2014), and several real-life relationships are non-homogeneous (Ragin, 2008). Therefore, the study broadens strategic management theory and offers actionable insights for SME owners and managers by demonstrating different configurations that account for the presence and absence of SMEs' sustainable innovation outcomes.

### 6.3 Managerial implications

Practically, the study offers invaluable implications for SME managers and owners seeking to rely on their environmental orientation to foster sustainable innovation initiatives. SME managers should prioritise the development of all the dimensions of their organisational resilience, from behaviour, resource and capability, as they need to recognise that each aspect of resilience contributes differently yet complementarily to their firm's sustainability orientation effectiveness. Specifically, SMEs should actively invest in building their resilience capabilities because this capability is best manifested through their routines, which can therefore facilitate the restructuring of organisational resources to deal with future uncertainty and market changes. Additionally, SME managers should purposely facilitate the conditions that build their resilience resources through proper financing and resource management. SME managers should also become efficient in resource management by channelling their

financial, cognitive, and relational resources to areas that need urgent resources. Additionally, SMEs must recognise resilience as a resource competence, which needs to be acquired through continuous learning and training programs. SME managers and owners should design team-building initiatives and training programs that strengthen their teams' resilience, as when well nurtured, they will influence their management decisions, especially in times of market uncertainty or product failure.

Further, SME managers and owners ought to recognise that sensing capability, which is created through a sequence of whole closed-loop operations such as collection and extraction, analysing and assessing internal and external data, becomes key not only to the nurturing of their firm's dynamic capability but also crucial to strengthening their firm's environmental orientation outcomes. Considering that sources of business innovation, particularly in emerging markets, are derived either within or externally (i.e., through adoption), SME owners and managers have to invest in their firms' sensing capabilities. For instance, by creating and strengthening their research and development units, they can have an in-house capability to identify emerging and latent market needs and trends. As SMEs invest in their research and development, they improve their ability to identify new trends and use that insight to improve their environmental sustainability strategy and consequently achieve better sustainable innovation outcomes. Additionally, it has to be reiterated that, unlike other firm-level capabilities, dynamic capability resides in its management and is derived from the skills of the top management. Therefore, SME managers and owners must nurture cognitive competencies like observation, concentration, problem-solving, and communication. These skillsets will undergird their firms' dynamic capabilities and facilitate their infusion within the organisational set-up.

Again, because of the resource constraints SMEs in developing economies face vis-à-vis limited technical know-how, restricted financial resources, and low access to research and development facilities, using their environmental orientation to only drive novel ideas rather than reproducing existing products in an eco-friendly way could be counterproductive. SME managers and owners have to recognise that innovation is not only born from new ideas but also can come from existing ideas or processes. Therefore, reproducing from the known rather than investing time, money, and effort in the unknown could heavily affect their finances, considering their resource restrictions. Lastly, although SMEs that integrate sustainability practices into their business could see improved resource efficiency through process and strategy modifications, the results from the study confirmed that environmental orientation may not directly translate into better sustainability innovation. From the study's findings, internal abilities such as seizing and reconfiguring are fundamental to support a firm's environmental orientation and, consequently, support its sustainable innovation. SME owners and managers should institute appropriate training modules that enable their workers to be proactive and take advantage of the market opportunities they

gather during their market sensing. For instance, the capability of a firm to see many returns from its strategic orientation relies not only on the development of several internal abilities, but also on how quickly it responds to market needs or changes in product demand.

# 7. CONCLUSIONS AND SUGGESTIONS FOR FUTURE RESEARCH

Although there has been an increase in studies on sustainability orientation, most of these studies have mainly explored its consequences on firms' financial and environmental performance (Menguc & Ozanne, 2005; Yasir et al., 2020; Liao et al., 2025). The impact of environmental orientation on firms' sustainable innovation outcomes has often been viewed as a complementary effect rather than a direct consequence (Yang & Jiang, 2023). To clarify this view, the study investigated the direct effect of environmental orientation on SMEs' sustainable innovation outcomes. Secondly, considering the peculiarities of SMEs and the market challenges of developing economies, the study explored the interactive role of organisational resilience in the relationship between environmental orientation and sustainable innovation. Though resilience has seen a surge in management and organisation research (Conz & Magnani, 2020; Raetze et al., 2021), particularly in fields like psychology (Oshio et al., 2018), economics (Lazzaroni & van Bergeijk, 2014), business management (Bhamra et al., 2011; Linnenluecke, 2017) and supply chain management (Iftikhar et al., 2021), studies investigating its impact on SMEs remain underexplored (Zhou et al., 2023). Therefore, to address this gap, this research investigated the mediating role of organisational resilience in the environmental orientation and sustainable innovation relationships. The study expands the literature on how SMEs develop resilience to move on in the context of the unexpected endogenous and exogenous crises that threaten the expectations of their environmental sustainability orientation.

Additionally, though scholars agree on the multi-dimensionality of the organisational resilience concept (Moran, 2016; Linnenluecke, 2017; Hillmann & Guenther, 2021), the extant literature still measures the construct as a single-level concept (e.g., Ray et al., 2011; Ortiz-de-Mandojana & Bansal, 2016; Parker & Ameen, 2018). This study viewed resilience as a multi-dimensional construct and investigated the varying dimensions of resilience on SMEs' sustainable innovation. In so doing, results from the study help SME managers and owners to prioritise the development of all the dimensions of their organisational resilience since each dimension contributes differently to their firm's environmental orientation effectiveness.

Also, although some studies have explored dynamic capability (DC) as the firm-level capability which supports firm strategic orientation and performance outcomes, little is known about how SMEs can leverage their dynamic capability to strengthen their sustainable innovation outcomes (Kang et al., 2012; Randhawa et al., 2021). The study explored dynamic capability components' roles in SME environmental orientation and sustainable innovation outcomes, offering a deeper perspective on the aspects of the dynamic capability antecedents that generate better sustainable innovation outcomes. Furthermore, theoretically, several

studies agree on the epistemological difference between the sub-components of the dynamic capability construct, sensing, seizing and reconfiguration; many have still overlooked the separate effects of each component on firm performance outcomes (Farzaneh et al., 2022). To highlight the distinct impact these dimensions play in SMEs' outcomes, this research separately measured the impact of the sub-dimensions of dynamic capability: sensing, seizing, and reconfiguration in the relationship between environmental orientation and SMEs' sustainable innovation. By assessing the dynamic capability separately, findings from the study confute the implicit and explicit proposition that having all the antecedents of dynamic capability concurrently would essentially generate a better firm performance outcome (Eisenhardt & Martin, 2000; Barreto, 2010). For instance, findings from the fsQCA underscore that having the presence of sensing, seizing, and configuration concurrently may not always create improved performance outcomes. It may even undermine the existence of sustainable innovation, especially when its presence is not required in a given context.

## 7.1 Limitations and Directions for Future Research

Similar to other studies, this research is not free from limitations. Although the measurement of the dependent variable (i.e., sustainable innovation ) was purposively separated from environmental orientation, organisational resilience (i.e., resilience behaviour, resource and capability) and dynamic capability (i.e., sensing, seizing and reconfiguration) measures over two weeks, the exclusive reliance on survey data could limit the study from making a more rigorous causality inference about the constructs. Therefore, future studies should use a longitudinal research design to rectify this weakness.

Second, while this study examined organisational resilience and dynamic capability as an interactive variable, other important organisational attributes—such as leadership orientation and organisational culture—may also influence how environmental orientation fosters better sustainable innovation outcomes and merit future investigation. Additionally, other boundary factors such as industry characteristics, market strategy (i.e., import vs export driven) and source of equity could moderate the relationship between environmental orientation and sustainable innovation. Therefore, future studies should explore how these factors undergird this relationship, as this study solely examined the mediating effect of organisational resilience and dynamic capability in the relationship between environmental orientation and sustainable innovation. Lastly, the research's primary emphasis on Ghana, a sub-Saharan developing country dishevelled in numerous market disruptions, limits the generalisability of findings. Replicating the study in other developing or less developed economies with varying market conditions would provide additional insights.

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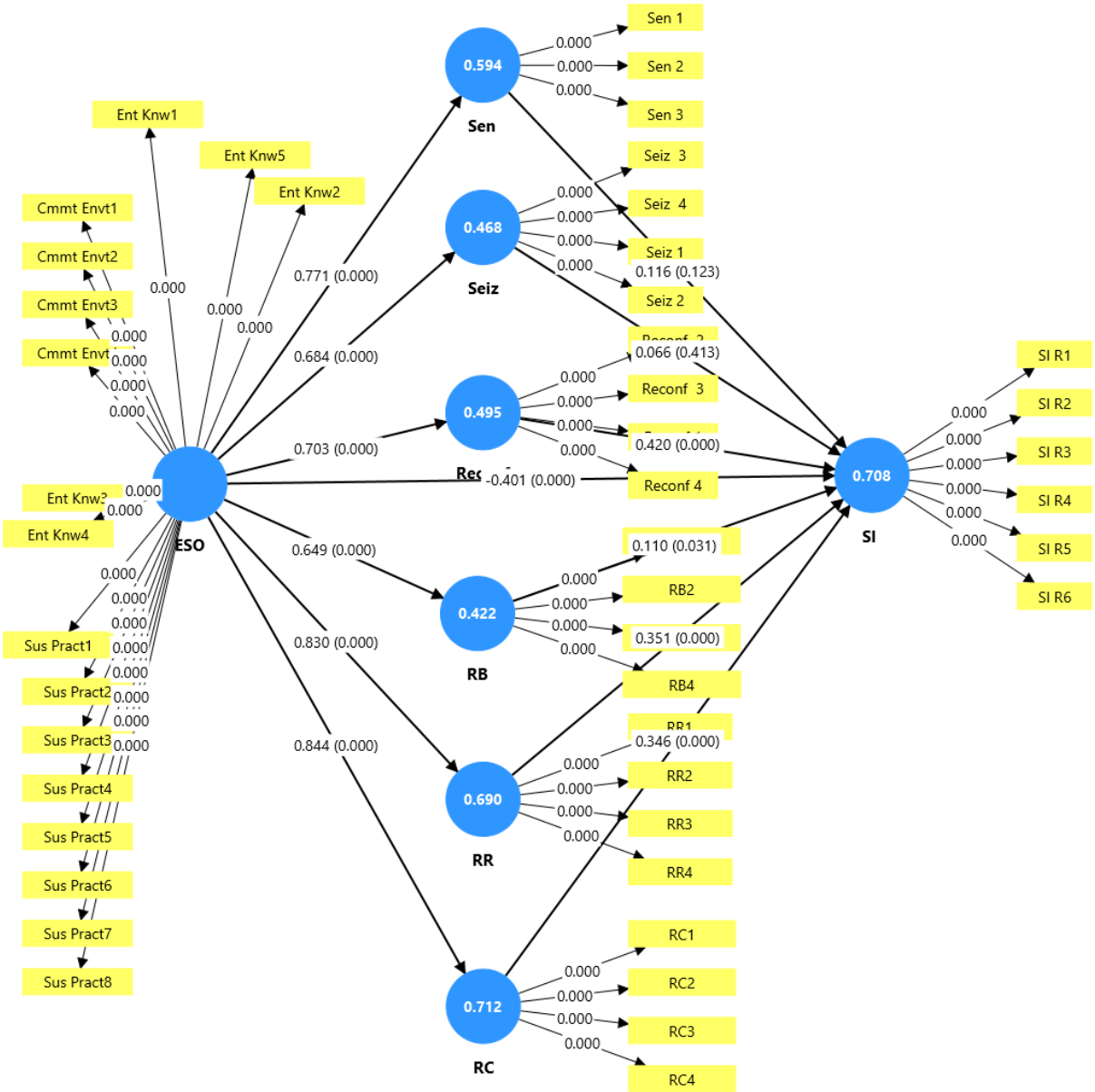
# APPENDICES

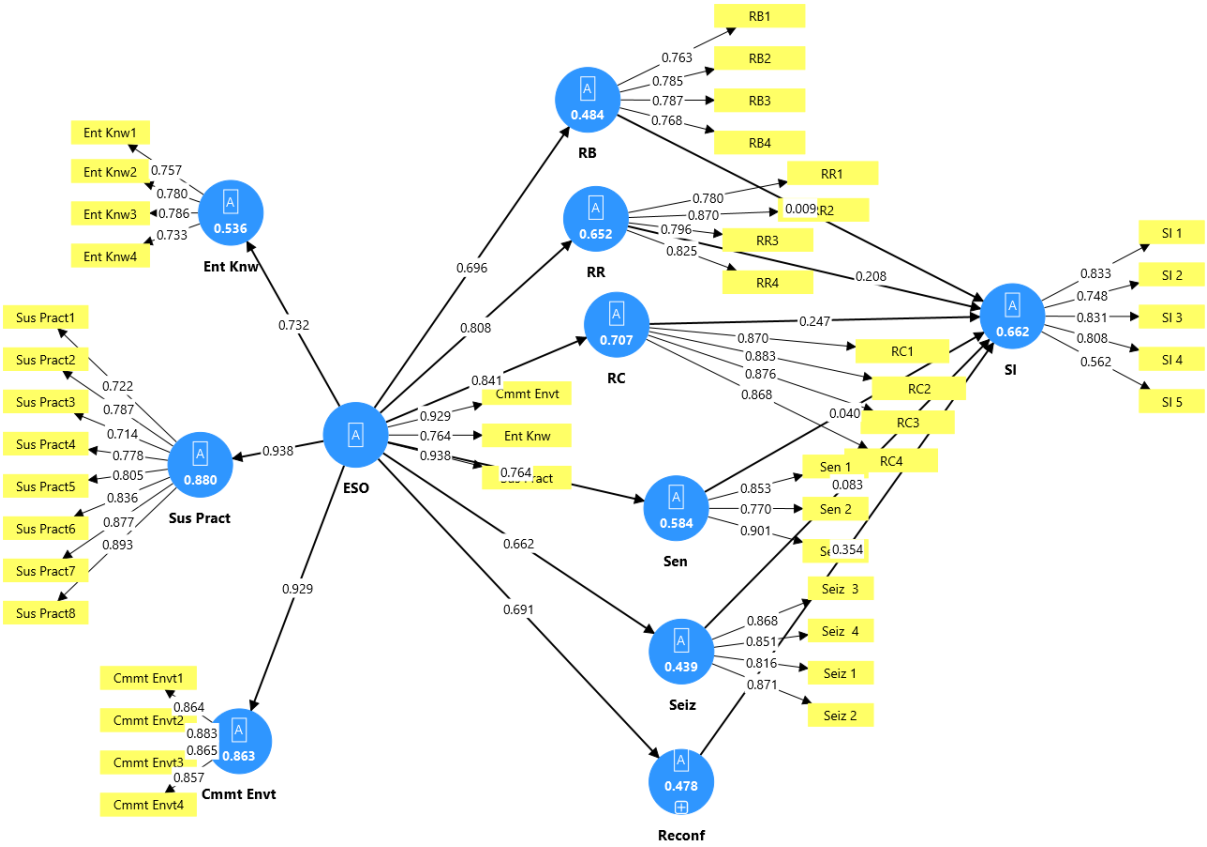
**Appendix A:** Chi-square test for comparison of T1 and T2 respondents

| Variables | Value | Df | p-value |
|---|---|---|---|
| Age | 0.89 | 3 | 0.69 |
| Gender | 1.00 | 2 | 0.88 |
| Education | 0.86 | 2 | 0.65 |
| Experience | 4.68 | 3 | 0.5 |

**APPENDIX B:** Estimate of the original model



**APPENDIX C:** PLS-SEM algorithm results generated from the HOC estimate



# LIST OF PUBLICATIONS BY THE AUTHOR

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**Journal publications**

1. **Asante, K.** (2023): Hotels' green leadership and employee pro-environmental behaviour, the role of value congruence and moral consciousness: evidence from symmetrical and asymmetrical approaches, Journal of Sustainable Tourism, DOI:10.1080/09669582.2023.2229534 – **Ford 5.9 Decile 1%AIS 96.567** CABS 3***
2. Asante, K., Sarpong, D., & Boakye, D. (2025). On the consequences of AI bias: when moral values supersede algorithm bias. Journal of Managerial Psychology, 40(5), 493-516, **Ford 5.2 Quartile 1 %AIS 80.670** CABS 3***
3. Osei, E., Boakye, D. & **Asante, K.** (Re)envisioning the role of technology transfer intermediaries in sociotechnical transition. J Technol Transf (2025). https://doi.org/10.1007/s10961-025-10241-7- **Ford 5.2 Quartile 1 %AIS 78.614,** CABS 3***
4. **Asante, K.,** Novak, P. When the push and pull factors in digital educational resources backfire: the role of the digital leader in digital educational resource usage. Educ Inf Technol (2023). https://doi.org/10.1007/s10639-023-12095-8, **Ford 3.3 Education Q1 %AIS 86.655**
5. **Asante, K.,** & Novak, P. (2024). Predicting nurses' safety compliance behaviour in a developing economy, using the theory of planned behaviour: A configurational approach. Journal of Advanced Nursing, 80, 1097–1110. https://doi.org/10.1111/jan.15846, **Ford 3.3 Health Sciences Q1 %AIS 75.355**
6. Asante, K. (2024), To Speak Up or Not to Speak Up, Organisational and Individual Antecedents That Undergird This Behaviour in a Resource-Constrained Region. J Adv Nurs. https://doi.org/10.1111/jan.16446, **Ford 3.3 Health Sciences Q1 %AIS 75.355**
7. **Asante, K.,** Kwarteng, M., Sabog, A., & Afful, C.R. The role of digital leadership: algorithmic human resource adoption and its continued use among human resource managers. Strategy & Leadership 2025; https://doi.org/10.1108/SL-02-2025-0026 CABS 1*

In-press

8. **Asante, K.**, Novak, P., Sarpong, D. & Kwarteng, M. Sustainability orientation and sustainable innovation: Can organisational resilience

clarify the missing link? Business Strategy and the Environment- BSE-25-4463. R2 **Ford 5.2 Decile 1 %AIS 92.208** CABS 3***-forthcoming

9. **Asante, K.,** Sarpong, D. & Novak, P. Employees' Green Creative Behaviour: Does it lie in job autonomy or employee resilience? International Journal of Tourism Research- JTR-24-1686. **Ford 5.9 Other Social Science Quartile 1 %AIS 81.602** R1- CABS2** forthcoming
10. **Asante, K, Novak, P., & Konadu, A.A.** Can personal norms trigger positive deviance? Contagious effect of nurses' perception of leaders' antisocial behaviour- Journal of Advanced Nursing- JAN-2024-4341.R2- **Ford 3.3 Health Sciences Q1 %AIS 75.355**

## EDITED BOOK CHAPTERS

**1.** Asante, K., Novak, P. and Kwarteng, M.A. (2024). "Environmental Sustainability Orientation, Dynamic Capability, Entrepreneurial Orientation, and Green Innovation in Small- and Medium-sized Enterprise", Andersen, T.J. (Ed.) Sustainable and Resilient Global Practices: Advances in Responsiveness and Adaptation (Emerald Studies in Global Strategic Responsiveness), Emerald Publishing Limited, Leeds, pp. 55-79. https://doi.org/10.1108/978-1-83797-611-920241004

## ACADEMIC CONFERENCES

1. **Asante, K.,** Novak, P., & Kwarteng, O.V. (2022). How stakeholder engagement can affect information management project implementation success: A conceptual paper. British Academy of Management 2022 Conference [University of Manchester, 31/08/2022 – 03/09/2022]
2. Owusu, V., Gregar, A. & Asante, K. (2022). Cyber-Security Training and Organisational Performance: A Perspective from a Developing Economy. British Academy of Management 2022 [University of Manchester, 31/08/2022 – 03/09/2022]
3. **Asante, K.,** Novak, P., & Kwarteng, M.A. (2023). Hotel's environmental orientation and green creativity: the role of green dynamic capability and autonomy. European Academy of Management Conference 2023, [Trinity Business School, Dublin, Ireland, 14/06/2023 – 16/06/2023]
4. **Asante, K.** & Novak, P. (2023). Environmental sustainability orientation, dynamic capability, organisational resilience and small and medium-sized enterprises' sustainable innovation in sub-Saharan Africa: Evidence from Ghana, [British Academy of Management 2023 Conference, University of Sussex, UK, 01/09/2023 – 06/09/2023]

5. **Asante, K.** & Kwarteng, M.A. (2024). On the consequences of AI bias: When moral values supersede algorithm bias. Society for Marketing Sciences [SMA, N Tampa St, Tampa, 06 November - 09 November 2024]
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Kwadwo Asante

# Enhancing Sustainable Innovation through Environmental Orientation: The Role of Dynamic Capabilities and Organisational Resilience in Small and Medium-Sized Enterprises

Posilování udržitelné inovace prostřednictvím environmentální orientace: Role dynamických schopností a organizační odolnosti v malých a středních podnicích

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