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

Kwadwo Asante, Ph.D.

Doctoral Thesis Summary

Tomas Bata University in Zlín

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Faculty of Management and Economics

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

Author: **Kwadwo Asante, Ph.D.**

Degree Program: P0413D050013 Economics and Management

Supervisor: doc. Ing. Petr Novak, Ph.D.

Examiners: prof. Ing. Zuzana Tučková, Ph.D.
doc. Ing. Martin Klepek, Ph.D.

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ABSTRACT

Although sustainable innovation holds strategic importance in addressing the rising global environmental challenges, how environmental sustainability 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 sustainability 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, resources and capability) may form part of the boundary conditions that improve environmental sustainability 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 squares 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 environmental sustainability orientation and sustainable innovation relationship revealed that, from being a mere correlation, resilience behaviour, resources, and capabilities mediated the relationship between environmental sustainability orientation and sustainable innovation. These interaction effects were subsequently identified as partial mediation, as environmental sustainability 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 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

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).

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, 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

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 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 resource 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.

2. LITERATURE REVIEW

2.1 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).

2.2 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. Although there is no standard 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.

2.3 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 re-adjust 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). 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 organisational structures as market conditions change (reconfiguring).

2.4 Sustainable innovation

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.

2.4 Theoretical review

2.4.1 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). 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.

2.4.2 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).

2.5 Hypotheses Development

2.5.1 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). 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.

2.5.2 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). 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).

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. Firms that fail to build their sensing capabilities tend to lose out significantly on market trends and changes. 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).

2.5.3 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. 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. On this basis, the seizing capability of SMEs will have a greater impact on their sustainable innovation outcomes.

The mediating role of seizing

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.

2.5.4 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). 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.

The mediating role of reconfiguration

Since SMEs' existing structures may not support a comprehensive consultation and collaboration, they must build new knowledge and competencies and reconfigure their existing resources 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).

2.5.5 Resilience behaviour and sustainable innovation

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). Firms that exhibit this behaviour are more likely to recuperate and learn from difficulty and uncertainty than less resilient organisations (Luthans et al., 2006). 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 to save costs (Hendricks & Singhal, 2005; Golgeci & Ponomarov, 2015). On this note, resilience behaviour will significantly influence SMEs' sustainable innovation.

The mediating role of resilience behaviour

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.

2.5.6 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). 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). Therefore, organisations with resilient resources can 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. Accordingly, resilience resources are expected to influence SMEs' sustainable innovation significantly.

The mediating role of resilience resource

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. 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 resource mediates the relationship between environmental orientation and sustainable innovation.

2.5.7 Resilience capability and sustainable innovation

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. 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. 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.

The mediating role of resilience capability

An SME which seeks to integrate sustainability principles into its innovation management 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.

2.5.8 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. 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.

2.6 Conceptual framework

Guided by the research objectives and literature reviewed, the study suggests a conceptual model (see Figure 2.1).

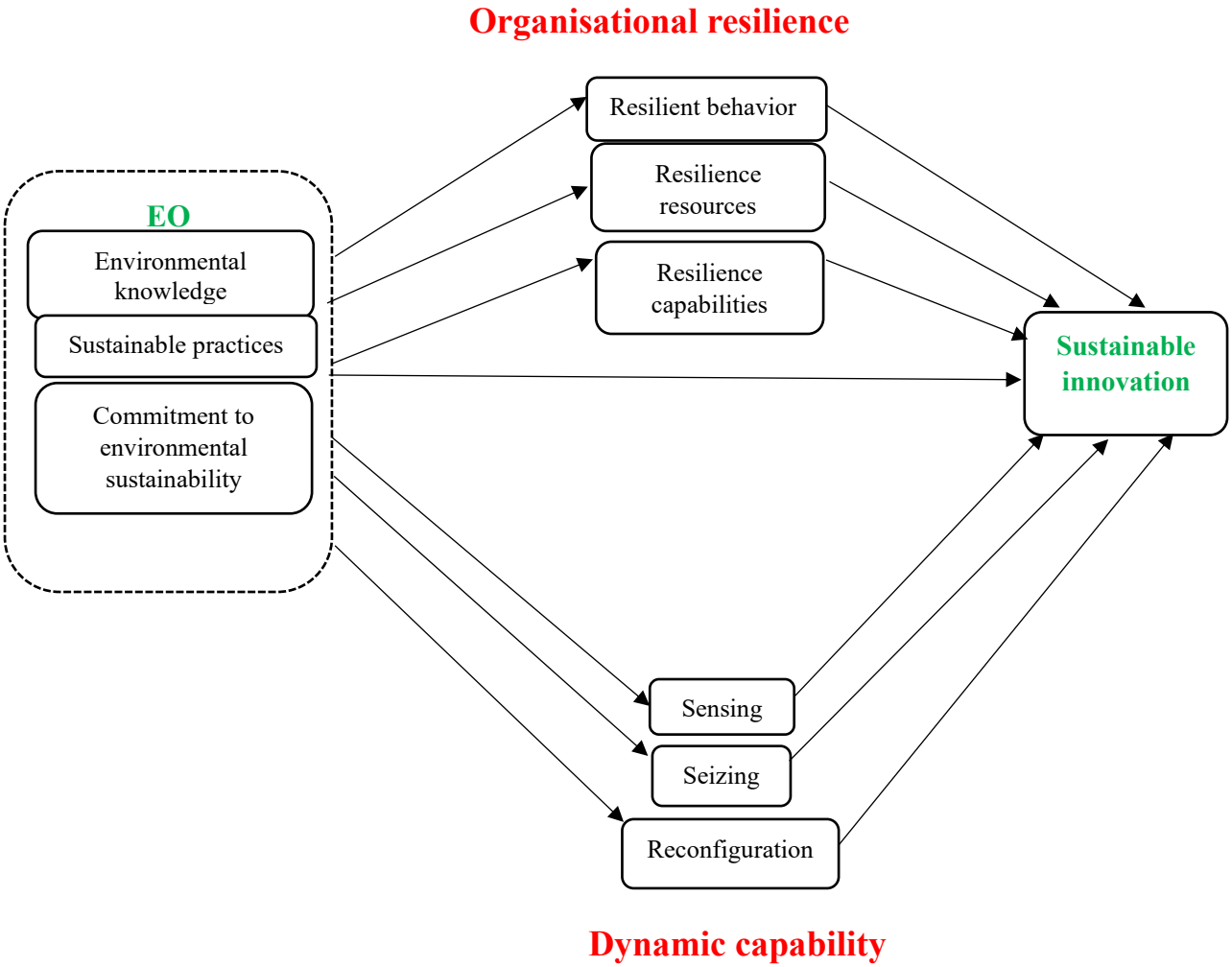

Fig. 2.1: Research model

Source: Author's Own, 2025

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*)

3 METHODOLOGY

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.

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). 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, therefore, 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).

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). With sustainable innovation, 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 to agree, 5=strongly agree).

Dynamic capability is a first-order reflective construct (sensing, seizing and reconfiguring), whose scale was adapted from the studies of Mikalef and Pateli (2016), Protogerou et al. (2012) and Ilmudeen et al. (2021). 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).

3.5 Common method bias

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). 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).

3.6 Analytical methods

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). The fuzzy set qualitative comparative analysis (fsQCA) was used for the asymmetrical approach. 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).

4. DATA ANALYSIS AND PRESENTATION OF FINDINGS

4.1 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 (χ^2= 191.085; df = 147; p<0.001; χ^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). 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 4.1 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 of 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 4.1 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 4.2 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). 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 4.2 reveal that the HTMT scores for all the constructs were <0.85, suggesting that all the constructs were conceptually different.

4.2 Structural model assessment

Testing of direct relationship: 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). Out of the thirteen direct relationships tested, three of the pathways (i.e., RB→SI, Seiz→SI and Sen→SI) reported statistically insignificant relationships. The results in Table 4.3 reveal that environmental orientation had a significant relationship with resilience behaviour (β=0.695, $p<0.001$). Similarly, environmental orientation had a significant relationship with resilience capability and resilience resource (β=0.841, $p<0.001$) and resilience resource, respectively (β=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 (β=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 4.3 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 4.3 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.

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 procedures were 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, organisational resilience (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 4.4.

Table 4.3 Results of the structural model path coefficients

Paths	Coeff (β)	SD	T-values	F^2	97.5% CI	VIF	P values
EO -> RB	0.695	0.053	12.210	0.352	[0.535, 0.743]	1.000	0.000***
EO -> RC	0.841	0.029	28.658	0.416	[0.781, 0.896]	1.000	0.000***
EO ->Recon	0.691	0.034	20.453	0.316	[0.632,0.768]	1.000	0.000***
EO -> RR	0.766	0.026	31.382	0.412	[0.773, 0.877]	1.000	0.000***
EO -> Seiz	0.662	0.046	14.722	0.381	[0.587,0.770]	1.000	0.000***
EO -> Sen	0.765	0.029	26.847	0.345	[0.713, 0.825]	1.000	0.000***
EO -> SI	0.713	0.027	26.296	0.096	[0.655, 0.761]	4.556	0.000***
RB -> SI	0.016	0.051	0.348	0.031	[0.017, 0.212]	1.472	0.728
RC -> SI	0.256	0.082	4.225	0.158	[0.177, 0.498]	3.398	0.002***
Reconf -> SI	0.359	0.057	7.395	0.147	[0.309, 0.528]	3.072	0.000***
RR -> SI	0.203	0.078	4.470	0.120	[0.194, 0.499]	2.826	0.001***
Seiz -> SI	0.074	0.081	0.819	0.001	[-0.077, 0.234]	2.987	0.413
Sen -> SI	0.045	0.075	1.544	0.019	[-0.030, 0.267]	4.053	0.123

Quality criteria	R-square	Adjusted R-square	Predictive Relevance, Q^2 (= 1-SSE/SSO
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)

Table 4.4 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.

5. CONFIGURATIONAL ANALYSIS OF ENVIRONMENTAL ORIENTATION OUTCOMES ON SMES

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 involved three processes: data calibration, truth tabulation, and counterfactual analyses (Olya et al., 2020). 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). The truth table was reduced for conditions that predicted a better consequence by setting the frequency cutoff 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). With the necessary condition analysis (NCA), the results 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.

To identify the configurations of recipes that explained SMEs' sustainable innovation, the sufficient condition analysis (SCA) was 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).

Table 5.1 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 5.1 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. With **solution 2**, it was established 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.

With **solution 3**, it was observed 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.

Lastly, with the fourth configuration, results from Table 5.2 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. 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.

6. DISCUSSION OF FINDINGS AND CONTRIBUTIONS

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 pathways (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. 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).

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. 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).

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.

6.2 Theoretical contributions

This study empirically verified the relationship between environmental orientation and SMEs' sustainable innovation outcomes. The study is the first to empirically test the direct relationship between environmental orientation and

SMEs' sustainable innovation. 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). 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). 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. 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). 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

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. 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 those sources of business innovation, particularly in emerging

markets, that are derived either within or externally (i.e., through adoption), SME owners and managers must invest in their firms' sensing capabilities.

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.

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, 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). 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.

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.

7.1 Limitations and Directions for Future Research

Although the measurement of the dependent variable (i.e., sustainable innovation) was purposively separated from environmental sustainability 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.

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LIST OF PUBLICATIONS BY THE AUTHOR

DOI: orcid.org/0000-0001-7977-1913

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***
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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

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AUTHOR'S CURRICULUM VITAE

EDUCATION (QUALIFICATION)

Doctoral candidate, Tomas Bata University, Zlin (September 2022- December 2025), thesis topic: Environmental sustainability orientation, dynamic capability, organisational resilience and small and medium-sized enterprises' sustainable innovation. Final defence due in November 2025.

Master of Business Administration, Human Resource Management and Organisational Behaviour, University of Education, Winneba, Ghana (2013-2015)

Diploma in Education, University of Education, Winneba, Ghana (June 2014-September 2015)

Mobility Traineeship, Copenhagen Business School, Department of International Economics, Government and Business, Porcelænshaven 24, DK-2000 Frederiksberg (June 2024- November 2024)

Work Experience

Allyn International Prague, 04/06/2024- Present

Job Title: **Senior Logistics and Procurement Specialist**

- Checked commercial invoices, master airway bill and bill of lading to ensure their full compliance with contractual terms.
- Responsible for routing shipments within Sub-Saharan Africa.
- Collaborated effectively with all international export teams across Latin America, Europe, Africa, the Middle East and Asia Pacific.

TEACHING EXPERIENCE

Jan 2023-June 2024, Faculty of Management and Economics, Tomas Bata University, Zlin, Czech Republic, Assistant lecturer

- Seminar facilitator for the Applied Marketing course for undergraduate students.
- Lecturer, Business Economics I & II for undergraduate and master's students

Grants & Funded Projects

- eHorizon Europe (HORIZON) 101071300 - Sustainable Horizons - European Universities designing the horizons of sustainability (SHEs), 1 September 2022 - 31 August 2024 (https://cordis.europa.eu/project/id/101071300

- **Principal investigator: IGA/FaME/006/2023- Internal Grant Project, Tomas Bata University, Czech Republic**: Environmental sustainability orientation, dynamic capability, entrepreneurial orientation and small and medium-sized enterprises green innovation."
- **Principal investigator: IGA/FaME/001/2025- Internal Grant Project, Tomas Bata University, Czech Republic**: "Does it lie in job autonomy or employee resilience? Disentangling Hotel Employees' Green Creative Behaviour: A PLS-SEM and fsQCA approach."

ADHOC REVIEWER

Reviewer, Academy of Management Conference, [14/02/2024- Present]

Ad hoc Reviewer, Journal of Cleaner Production

Ad hoc Reviewer, Journal of Sustainable Tourism

Ad hoc Reviewer, International Journal of Tourism Research

Ad hoc Reviewer, International Journal of Hospitality & Tourism Administration

Ad hoc Reviewer, Strategy & Leadership

Ad hoc Reviewer, Journal of Knowledge Management

Ad hoc Reviewer, Business Strategy and the Environment

Kwadwo Asante, Ph.D.

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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