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Building entrepreneurial resilience during crisis using generative AI: An empirical study on SMEs

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ABSTRACT

Recently, Gen AI has garnered significant attention across various sectors of society, particularly capturing the interest of small business due to its capacity to allow them to reassess their business models with minimal investment. To understand how small and medium-sized firms have utilised Gen AI-based tools to cope with the market's high level of turbulence caused by the COVID-19 pandemic, geopolitical crises, and economic slowdown, researchers have conducted an empirical study. Although Gen AI is receiving more attention, there remains a dearth of empirical studies that investigate how it influences the entrepreneurial orientation of firms and their ability to cultivate entrepreneurial resilience amidst market turbulence. Most of the literature offers anecdotal evidence. To address this research gap, the authors have grounded their theoretical model and research hypotheses in the contingent view of dynamic capability. They tested the research hypotheses using cross-sectional data from a pre-tested survey instrument, which yielded 87 useable responses from small and medium enterprises in France. The authors used variance-based structural equation modelling with the commercial WarpPLS 7.0 software to test the theoretical model. The study's findings suggest that Gen AI and EO have a significant influence on building entrepreneurial resilience as higher-order and lower-order dynamic capabilities. However, market turbulence has a negative moderating effect on the path that joins entrepreneurial orientation and entrepreneurial resilience. The results suggest that the assumption that high market turbulence will have positive effects on dynamic capabilities and competitive advantage is not always true, and the linear assumption does not hold, which is consistent with some scholars' assumptions. The study's results offer significant contributions to the contingent view of dynamic capabilities and open new research avenues that require further investigation into the non-linear relationship of market turbulence.

1. Introduction

During times of crisis, entrepreneurs face unique challenges that demand resilience and adaptability (Bullough and Renko, 2013; Dahles and Susilowati, 2015; Grover and Sabherwal, 2020), necessitating swift adjustments to business strategies, responding to market shifts, and devising innovative solutions to unforeseen challenges (Kirtley and O'Mahony, 2023). entails surviving adversity and thriving and seizing new opportunities (Purnomo et al., 2021), rooted in a growth mindset, a capacity to learn from failure, and a willingness to take calculated risks (Khurana et al., 2022). By fostering resilience, entrepreneurs can better navigate uncertainty and emerge stronger long-term (Hadjielias et al., 2022).

Amidst the evolving business landscape, enterprises of all sizes turn to generative AI (Gen AI) to maintain competitiveness (Kar et al., 2023; Mahotra and Majchrzak, 2024; Filippo et al., 2024). The rapid advancement of digital technologies, including Gen AI, Metaverse and cloud computing, has spurred the growth of digitally enabled business models entrepreneurship (Zahra et al., 2006; Si et al., 2023; Fellnhofer, 2023). Leveraging advanced algorithms and machine learning techniques, Gen AI empowers businesses to automate tasks, predict trends and identify new opportunities (Budhwar et al., 2023), crucially enhancing entrepreneurial resilience (Shepherd and Majchrzak, 2022). Gen AI boosts efficiency by streamlining operations and automating

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processes, enabling businesses to weather market fluctuations (Parmar et al., 2014) while identifying and capitalising on new opportunities to maintain competitiveness (Kanbach et al., 2024). Gen AI is a powerful tool for fostering resilience and competitiveness in today's dynamic economy (Bankins et al., 2023), allowing businesses to thrive in challenging environments (Dwivedi et al., 2023; Kar et al., 2023).

Entrepreneurial resilience (ER) is vital for business success, particularly in uncertain times (Shepherd et al., 2020). ER denotes a business's capacity to overcome challenges and adapt to unpredictable situations while maintaining core values and adjusting strategies to match changing market conditions, essential for long-term success (Hillmann and Guenther, 2021). Though the concept of ER has gained attention in academic literature (Salvato et al., 2020; Khurana et al., 2022), more focus is needed on AI capabilities and Gen AI's potential to foster ER (Isensee et al., 2023; McElheran et al., 2024). While Gen AI may not directly impact ER, entrepreneurs' risk management is crucial in leveraging Gen AI's potential to strengthen ER.

Entrepreneurial orientation (EO) plays a critical role in translating Gen AI outcomes to identify potential risks and opportunities for organisations. EO allows firms to capture processes, practices, and activities that enable value creation through entrepreneurial endeavours (Wales et al., 2013). In the age of rapid digital transformation, an entrepreneurial mindset helps organisations cultivate Gen AI capabilities and develop dynamic competencies essential for small enterprises to navigate turbulent times effectively (Frick et al., 2021; Schiuma et al., 2022; Taherizadeh and Beaudry, 2023). This approach also aids in improving market share, launching new products, or increasing profitability (Dwivedi et al., 2021; Tschang and Almirall, 2022; Kshetri et al., 2023; Kanbach et al., 2024).

EO is defined as entrepreneurs' mindset and strategies for pursuing opportunities, innovation, and risk-taking (Wales et al., 2013; Dubey et al., 2020; Donthu and Gustafsson, 2020). High levels of EO enhance ER, enabling entrepreneurs to adapt to changing circumstances, recover from setbacks, and thrive amid challenges (Castro and Zermeño, 2021; Zighan et al., 2022). AI plays a pivotal role in fostering EO by encouraging innovation, risk-taking, and proactive identification of new business opportunities (Shepherd and Majchrzak, 2022; Davidsson and Sufyan, 2023; Upadhyay et al., 2023).

Hence, it can be argued that Gen AI has significantly changed how small businesses operate (Chen et al., 2023). With its advanced algorithms and machine learning capabilities, Gen AI has enabled small businesses to automate processes, enhance efficiency, and improve decision-making (Shepherd and Majchrzak, 2022). From predictive analytics to chatbots, Gen AI has equipped small businesses with tools and technologies that were previously accessible only to larger enterprises (Rizomyliotis et al., 2022), enabling them to compete in today's fast-paced market and maintain a competitive edge (Norbäck and Persson, 2024).

Recent studies in entrepreneurship have underscored the importance of digitalisation of small-sized organisations, especially during challenging periods like the COVID-19 pandemic (Leppäaho and Ritala, 2022). Small businesses face heightened demand and supply uncertainties due to geopolitical crises (Al-Thaqeb et al., 2022), prompting exploration into how AI-powered systems can aid in adapting to rapidly changing circumstances and identifying growth opportunities (Santos et al., 2023; Abaddi, 2023). However, despite this growing interest, empirical evidence supporting the efficacy of such systems is lacking. While promising case studies and anecdotal evidence exist, further research is needed to discern the potential benefits and limitations of employing Gen AI in this capacity. Ultimately, the efficacy of these systems in assisting small businesses to thrive amidst adversity warrants thorough assessment.

In previous studies, scholars have sought to elucidate the pivotal role of entrepreneurial orientation (EO) in an organisation's decision to invest in digital capability. However, unlike other technologies, Gen AI offers a unique advantage in shaping new business models that facilitate entrepreneurs in making informed decisions previously deemed arduous. Thus, this research gap presents an opportunity to broaden the theoretical debate surrounding EO. Early discussions on EO centred on three primary dimensions: top management, organisational structure, and new entry initiatives (Wales et al., 2020). Yet, the literature on the components of EO remains ripe for exploration (Anderson et al., 2015). We propose research question (RQ1) to address this potential research gap, aiming to investigate the impact of Gen AI tools on EO.

RQ1: What is the impact of Gen AI on EO?

Entrepreneurial Orientation (EO), delineating an organisation's strategic stance towards entrepreneurship, is crucial in developing and maintaining entrepreneurial resilience during times of crisis (Zighan et al., 2022). This suggests that businesses that embrace an entrepreneurial mindset and a propensity for calculated risk-taking are better equipped to navigate and overcome challenges brought about by crises (Sharma et al., 2024). A recent divergence among scholars in strategic management and entrepreneurship pertains to employing the dynamic capability view for examining entrepreneurial orientation as a dynamic capability (Zahra et al., 2006; Anderson et al., 2009). This debate advocates for the contingent view of dynamic capability, positing that the efficacy of dynamic capabilities is not solely dependent on organisational routines but also the contextual deployment of these capabilities (Levinthal, 2011; Sirmon and Hitt, 2009; Schilke, 2014). Scholars have argued that organisational adaptability is, to some extent, influenced by environmental forces (Hrebiniak and Joyce, 1985; Schilke, 2014), with market turbulence emerging as a potentially pivotal contextual variable in explaining the effects of dynamic capabilities (Wang et al., 2015). Nonetheless, extant studies have yet to explore how market turbulence (MT) moderates the path linking EO and ER. To address these research gaps, we pose our second research question.

RQ2: How does the MT moderate the path joining EO and ER?

The study examines EO as a mediating factor between Gen AI and ER, contributing significantly to entrepreneurship and strategic management discourse. While EO's role in nurturing ER is well-documented, its specific role as a mediator between Gen AI and ER requires deeper exploration. Our argument is based on the hierarchical view of dynamic capability (Winter, 2003). Fainshmidt et al. (2016) categorise dynamic capabilities into high-order and low-order capabilities. We define Gen AI as a fundamental lower-order dynamic capability for organisational learning. Higher dynamic capabilities are supported by flexible generative learning processes (Fainshmidt et al., 2016, p. 1354). In this study, we conceptualise EO as a higher-order capability that is difficult to replicate and is linked to performance.

Adopting the dynamic capability view, we investigate RQ1 and RQ2 (see Teece et al., 1997; Teece, 2007). The hierarchical view of dynamic capability supports the relationship between Gen AI, EO, and ER. It helps understand how lower-order capabilities influence higher-order capabilities, affecting performance, particularly under market turbulence (Schilke, 2014; Fainshmidt et al., 2016).

The contingent view of dynamic capabilities highlights the importance of an organisation's ability to adapt and innovate to maintain a competitive advantage amid shifting market dynamics. We gathered data by surveying small and medium-sized businesses in France considering adopting Gen AI tools. Our survey aimed to understand their perceptions of Gen AI benefits compared to previous AI tools, focusing on how Gen AI could improve their business processes and outcomes. We chose small and medium-sized businesses because they often adopt new technologies early but face unique challenges. Our study aims to show how these businesses can effectively leverage Gen AI tools to achieve strategic goals.

The research has two main contributions. Firstly, it enhances our understanding of entrepreneurial orientation and entrepreneurial

resilience in the Gen AI era. Secondly, it demonstrates how the study contributes to the contingent view of the dynamic capability perspective. In essence, the study provides valuable insights and contributes to the ongoing debate at the intersection of digital transformation, entrepreneurship, and strategic management.

The manuscript is organised as follows: The second section provides a theoretical background of the study. Section three presents the theoretical model and research hypotheses. The fourth section presents the research design. The fifth section presents the results obtained through data analysis using WarpPLS 7.0 commercial variance-based structural equation modelling software. The sixth section discusses the results in the light of theory, practice, and policy and further outlines the study's limitations and future research directions. Finally, we conclude the study.

2. Underpinning theories

2.1. Dynamic capabilities

Dynamic capabilities refer to a company's ability to adapt to changing market conditions and respond to emerging opportunities and threats (Teece et al., 1997). These capabilities are essential for organisations to manage uncertainty and gain a competitive edge (Teece, 2007). They involve developing new skills, processes, technologies, and organizational structures that enable firms to respond to changes quickly and effectively in their environment (Eisenhardt and Martin, 2000). By building dynamic capabilities, organisations can improve their agility, flexibility, and innovation prowess, leading to sustained competitive advantage over time (Teece, 2007).

Our study argues that Gen AI can become a powerful organizational dynamic capability. By leveraging Gen AI, organisations can better sense and identify opportunities in the market, seize them more efficiently, and configure their resources to respond to changes in the business landscape (Mariani et al., 2023). Gen AI can help organisations achieve these goals by analyzing vast amounts of data in real-time, identifying patterns, and generating insights that can inform decision-making (Dwivedi et al., 2023). Predictive models could also be developed to enable organisations to anticipate future market trends and adjust their strategies accordingly. Moreover, Gen AI can help organisations automate routine tasks, freeing up time and resources that can be redirected towards more strategic initiatives. Doing so can enhance productivity, reduce costs, and improve operational efficiency.

In summary, our study suggests that Gen AI has the potential to become a key driver of organizational success. By leveraging its capabilities, organisations can gain a competitive advantage in the market, adapt to changing circumstances more effectively, and achieve their strategic objectives more efficiently (Budhwar et al., 2023). According to the dynamic capability view proposed by Teece et al. (1997) and Teece (2007), organisations must develop dynamic capabilities to adapt to changing environments and achieve long-term success. One of these dynamic capabilities is entrepreneurial orientation (EO), which identifies and exploits new business opportunities (Dubey et al., 2020). We argue that EO, combined with Gen AI, can help organisations achieve entrepreneurial resilience (ER), which is the capacity to recover quickly from setbacks and continue pursuing business opportunities.

By leveraging these dynamic capabilities, organisations can stay ahead of the competition and achieve performance goals.

2.2. Generative artificial intelligence (Gen AI)

Recently, Gen AI has been the subject of considerable attention due to its remarkable ability to replicate human behaviour in intricate and complex settings (Budhwar et al., 2023). Using advanced algorithms and machine learning techniques, Gen AI can create original and realistic content such as images, videos, and even entire stories (Dwivedi et al., 2023). This technology has opened new possibilities in various industries, such as entertainment, marketing, and advertising (Kanbach et al., 2024). The potential applications of Gen AI are vast and far-reaching, and it is expected to play a significant role in shaping the future of technology and innovation in the coming years (Fosso Wamba et al., 2023). Gen AI technology has the potential to revolutionise the way SMEs and micro-firms operate by providing them with powerful analytical tools to help them stay competitive (Abaddi, 2023). With its advanced capabilities, this technology can assist small businesses in preparing detailed comparative analyses of their competitors, industry, and market dynamics (Mannuru et al., 2023). This information can help SMEs make informed decisions about their present and future course of action and take advantage of new opportunities (Prasad Agrawal, 2023). By leveraging Gen AI, small businesses can gain a competitive edge and accelerate their growth in a rapidly evolving business landscape (Wei and Pardo, 2022; Dwivedi et al., 2023).

2.3. Entrepreneurial orientation (EO)

Entrepreneurial orientation is a set of characteristics that entrepreneurial firms possess, which enable them to identify and capitalise on new opportunities (Lumpkin and Dess, 1996; Chaston and Sadler-Smith, 2012; Jiang et al., 2018). This orientation encompasses various factors such as innovation, risk-taking, proactiveness, and competitive aggressiveness (Kreiser and Davis, 2010). Entrepreneurial firms with a high degree of entrepreneurial orientation tend to be more innovative, proactive, and willing to take risks to achieve their goals (Hughes et al., 2022). These traits help them to be more competitive, adaptable, and thriving in the long run. Therefore, it can be concluded that entrepreneurial orientation is a vital aspect of any entrepreneurial firm that emphasises the importance of being innovative, proactive, and risk-taking in achieving sustainable growth (Matsuno et al., 2002; McGee and Terry, 2022). EO refers to the mindset and approach of a firm towards innovation, risk-taking, and proactivity in identifying and exploiting market opportunities (Zhang et al., 2020). This orientation is crucial in enabling a firm to navigate the challenges of an uncertain and rapidly changing business environment (Zighan et al., 2022). Firms with a strong entrepreneurial orientation tend to be more agile, adaptable, and resilient in facing challenges (Khan et al., 2021; Ferreras-Méndez et al., 2021). On the other hand, firms that lack this orientation are more likely to struggle in coping with uncertainties and may become stagnant or fail to thrive in the long run (Wang et al., 2021). Therefore, robust entrepreneurial orientation is essential for firms that seek to remain competitive and succeed in today's dynamic and unpredictable business landscape (Kock and Gemünden, 2021).

2.4. Entrepreneurial resilience (ER)

Entrepreneurial resilience is a quality that allows organisations to continue operating effectively despite facing disruptions such as economic downturns, natural disasters, or other unforeseen events (Iyengar et al., 2021). It involves the ability to adapt quickly to new circumstances, think creatively, and maintain a sense of optimism and determination in the face of adversity (Corner et al., 2017). Organisations with entrepreneurial resilience can weather the storm and emerge from difficult times more robust and resilient than ever (Thukral, 2021). They have a clear vision of their goals and remain focused on achieving them, even when faced with unexpected challenges (Chaudhary et al., 2024). One key aspect of entrepreneurial resilience is learning from past experiences and applying those lessons to future situations. This allows organisations to be better prepared for future disruptions and develop strategies to mitigate their impact (Arve et al., 2023). Overall, entrepreneurial resilience is crucial for any organisation that wants to succeed in today's rapidly changing business environment (Anwar et al., 2023). By maintaining a positive attitude, staying flexible, and being open to new ideas, organisations can continue to thrive despite uncertainty and adversity (Williams et al., 2017).

2.5. Market turbulence (MT)

Market turbulence refers to the sudden and unexpected changes in market conditions that impact an organisation's economic and financial stability (Zhou et al., 2019). It can be caused by various factors, such as changes in consumer demand, government policies, and natural disasters (Tsai and Yang, 2013). The effects of market turbulence can be felt through price volatility, supply chain disruptions, and changes in customer behaviour (Ostrom et al., 2021). As a result, organisations need to have policies and action plans to help them navigate through turbulent market conditions and emerge stronger (Marquis and Raynard, 2015). Such policies may include diversification of products and services, risk management strategies, and proactive measures to address customer needs and expectations. This study attempts to understand how market turbulence affects entrepreneurs' ability to adapt and succeed (Kam-Sing Wong, 2014). We aim to identify key strategies and practices to help entrepreneurs build a more resilient business.

3. Theoretical model and research hypotheses

The study is based on Teece's (2007) extended DCV, which suggests the effectiveness of dynamic capabilities is influenced by the conditions in which they are utilised (Schilke, 2014). The dynamic capability view emphasises the importance of an organisation's ability to adapt and respond to rapidly changing market conditions, a critical component of the DCV of a firm (Eisenhardt and Martin, 2000; Winter, 2003). This perspective highlights the significance of a company's capacity to reconfigure its resources and capabilities to thrive in highly dynamic and uncertain environments (Eisenhardt and Martin, 2000; Teece, 2007; Chirumalla, 2021).

Our focus is to understand entrepreneurs' behaviour, especially when small-sized organisations face high levels of uncertainty. Small-sized organisations may need access to skilled professionals or consultants, which is costly (Berry et al., 2006). In such cases, Gen AI can develop models and frameworks based on the current environment and the organisation's entrepreneurial ability to tackle challenges and recover to become resilient (Townsend and Hunt, 2019; Tran and Murphy, 2023; Berthon et al., 2024). We conceptualise Gen AI as a higher-order dynamic capability, created and sustained through bundling resources, including human skills, technological infrastructure, and a culture valuing data-driven decision-making (Mikalef and Gupta, 2021; Fosso Wamba et al., 2023). Gen AI can help organisations create new business models using large data sets and algorithms based on current situations (Fosso Wamba et al., 2023; Budhwar et al., 2023). Furthermore, it enables organisations to identify and capture new opportunities, respond quickly to changing market conditions, and adapt to disruptive technologies.

Building on Zahra et al. (2006, p. 918), we argue that EO is a dynamic capability evolving from learning experiences. The competitive advantage of EO lies in the organisation's ability to modify its resource base by creating, integrating, recombining, and releasing resources (Wiklund and Shepherd, 2003; Jantunen et al., 2005; Wales et al., 2013). In this study, we conceptualised EO as a lower-order dynamic capability. We propose an expanded view of EO grounded in Eisenhardt and Martin's (2000) arguments, suggesting dynamic capabilities are embedded in cumulative existing knowledge in moderately dynamic markets. These capabilities involve analysing existing knowledge and using rules of thumb, followed by implementation. MT is the necessary contingent factor that creates opportunities for organisations to identify challenges and leverage solutions existing in organisational memory (Schilke, 2014; Kalubanga and Gudergan, 2022). However, the effectiveness of Gen AI in enhancing entrepreneurial resilience and dynamic capabilities is contingent upon the level of market turbulence an organisation faces (Balta et al., 2023). The impact of Gen AI on competitiveness depends on the level of uncertainty and volatility in the business environment (van Dun et al., 2023).

To better understand the relationship between Gen AI and dynamic capabilities, it is essential to explore how organisations can leverage it to enhance their entrepreneurial orientation and resilience under varying market turbulence and uncertainty (Kar et al., 2023). In addition to dynamic capabilities (Gen AI and EO) and contingent factors (MT), entrepreneurial resilience (ER) is viewed as a performance outcome that, in times of crisis, offers a significant competitive advantage (Teece, 2016; Martinelli et al., 2018).

Therefore, this study examines Gen AI's effectiveness in enhancing organisations' entrepreneurial orientation and resilience in different market contexts. Fig. 1 presents our theoretical model that helps address our research questions.

3.1. Generative AI (Gen AI) and entrepreneurial orientation (EO)

The impact of emerging technologies on entrepreneurial orientation has been extensively researched (Clausen and Korneliussen, 2012; Mthanti and Urban, 2014; Chatterjee et al., 2020; Xia et al., 2024). AI (artificial intelligence) has enormous potential to guide organisations through uncertainties as an emerging technology (Dwivedi et al., 2021; Fosso Wamba, 2022; Kolupaieva and Tiesheva, 2023). AI can significantly influence various aspects of entrepreneurial orientation, such as risk-taking, innovation, proactiveness, and competitive aggressiveness (Dubey et al., 2020; Upadhyay et al., 2023). With the increasing use of AI-powered tools and technologies, entrepreneurs are better equipped to make informed decisions based on data, identify opportunities and trends, and adapt to changing market conditions (Upadhyay et al., 2023; Alalwan et al., 2023). As a result, AI has recently become a critical enabler of entrepreneurial orientation (Hansen and Bøgh, 2021; Shepherd and Majchrzak, 2022; Giuggioli and Pellegrini, 2022). AI offers immense guidance to entrepreneurs to develop, design and scale their companies during the entrepreneurial process (Obschonka and Audretsch, 2020; Chalmers et al., 2021). With the emergence of a new generation of workers, Gen AI, who have grown up surrounded by technology and are accustomed to its use, we hypothesise that their influence on entrepreneurial orientation will be significant (Abaddi, 2023). As such, further investigation is needed to explore how Gen AI's unique perspective and relationship with technology can be leveraged to enhance entrepreneurial behaviour within organisations. According to the dynamic capability view, Gen AI is a dynamic capability built by bundling strategic resources such as human skills, technology, and a data-driven culture (Mikalef and Gupta, 2021). Based on the arguments presented earlier, which are grounded in the dynamic capability view, we hypothesise that human skills (Gupta and George, 2016; Akter et al., 2016), technology (Akter et al., 2016; Gupta and George, 2016; Mikalef and Gupta, 2021), and a data-driven culture (Ciampi et al., 2021; Mikalef and Gupta, 2021) have a positive impact on entrepreneurial orientation. This study diverges from previous research by delving into the distinct effects of three different resources on EO, aiming to bring a clearer understanding of the subject. Wu et al. (2006) argue that organisational capabilities are higher-order constructs developed through the bundling of resources. Grant (1991) further argues that resources are combined and utilised to create capabilities. Similarly, Gupta & George (2016) conceptualised big data analytics capability as a higher-order construct obtained through a combination of tangible, human skills, and intangible resources. Therefore, based on these arguments, we conceptualise Gen AI as a higher-order dynamic capability obtained through human skills, technology, and a data-driven culture.

In a highly dynamic environment, the proficiency of managerial technology skills plays a crucial role in successfully implementing Generative AI (Agrawal, 2023). This is because managers need to deeply understand technological advancements and how they can be applied to maximise the potential of Generative AI (Singh et al., 2024). Hence, we can hypothesise it as.

H1a. Human skills (HS) positively affect entrepreneurial orientation

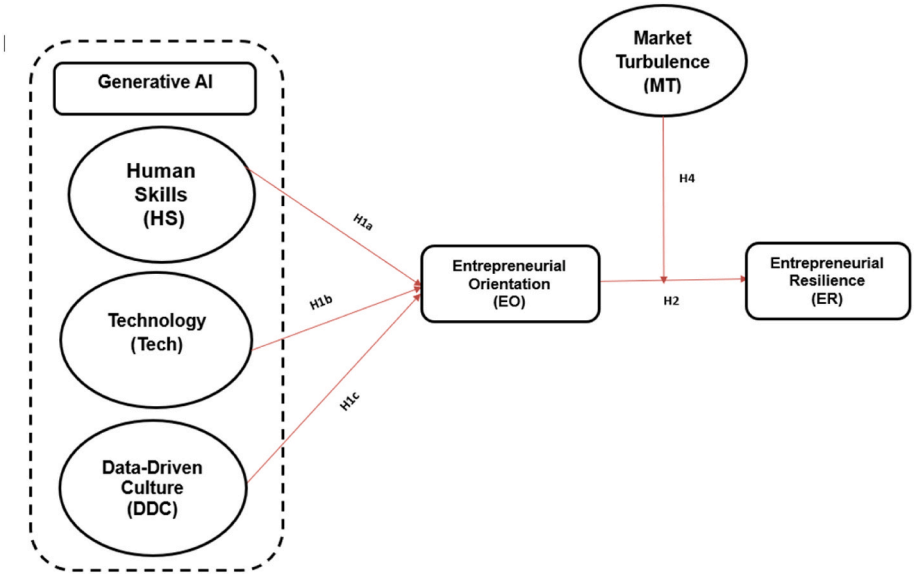

Fig. 1. Theoretical model.

(EO).

Moreover, the progress of technology, encompassing both hardware and software, is a cornerstone in establishing and maintaining the infrastructure for Generative AI (Kanbach et al., 2024). The availability of cloud computing facilities and advanced technologies has facilitated and empowered the use of Generative AI (Alhammadi et al., 2024). Cloud computing offers scalable and cost-effective resources, enabling AI models' swift deployment and scaling (Ghobakhloo et al., 2024). Advanced technologies, such as high-performance computing and efficient algorithms, have further enhanced the development and execution of Generative AI, instilling confidence in the potential of AI applications across various industries (Alhammadi et al., 2024; Ghobakhloo et al., 2024). Hence, we can hypothesise it as.

H1b. Technology (TECH) positively affects entrepreneurial orientation (EO).

Establishing a data-driven culture within the organisation involves creating an environment where decisions and strategies are informed by data analysis (Gupta and George, 2016). This entails fostering a mindset where data is valued and utilised to drive business operations and decision-making (Mikalef and Gupta, 2021). Cultivating a data-driven culture includes promoting employee data literacy, implementing data-driven processes and workflows, and utilising data analytics tools to gain actionable insights (Shet et al., 2021). This culture shift is crucial for the successful adoption and integration of Generative AI, as it ensures that the organisation is well-equipped to leverage data effectively in harnessing the capabilities of Generative AI for business growth and innovation (Holmström and Carroll, 2024). Hence, we can argue that these three resources as independent resources play a significant role in fostering entrepreneurial orientation. Hence, we can hypothesise it as.

H1c. Data-driven culture (DDC) positively affects entrepreneurial orientation (EO).

3.2. Entrepreneurial orientation (EO) and entrepreneurial resilience (ER)

ER refers to the ability of an entrepreneur or business to adapt and overcome challenges during crises (Khurana et al., 2022). Crises can arise from economic downturns, natural disasters, or pandemics. To remain viable during such times, entrepreneurs must have traits and behaviours that help them navigate uncertainty and emerge stronger (Engel et al., 2017). Organisations with strong EO are better equipped to respond to environmental changes and overcome challenges (Lumpkin and Dess, 2001; Kusa et al., 2022). These companies are more adaptable, resourceful, and resilient (Penco et al., 2023). Therefore, EO significantly contributes to building ER, which is the ability to bounce back from setbacks, learn from failures, and sustain long-term success (Zighan et al., 2022; Krishnan et al., 2022; Khurana et al., 2022).

EO is a crucial component of ER (Zighan et al., 2022; Gottschalck et al., 2021). It refers to entrepreneurs' proactive, innovative, and risk-taking mindset and approach. Highly entrepreneurial-oriented entrepreneurs are more likely to identify and capitalise on opportunities during a crisis rather than merely surviving (Bullough and Renko, 2013). They can pivot business models, develop new products or services, and find new markets while adhering to their core values and mission. Therefore, we hypothesise.

H2. Entrepreneurial orientation has a positive effect on entrepreneurial resilience.

3.3. The mediating effect of entrepreneurial orientation

Initially, we proposed that AI could directly impact ER (Shepherd and Majchrzak, 2022). However, while AI is a dynamic capability (Mikalef and Gupta, 2021; Fosso Wamba et al., 2024) and a potential source of competitive advantage, its effects on ER may be indirect, influenced by EO. Building on previous arguments, we contend that Gen AI is a dynamic capability with superior abilities to tackle uncertainties (Akter et al., 2023; Raisch and Fomina, 2024). We argue that Gen AI can facilitate EO by providing the structural foundation for the organisation to cultivate it. For example, the organisation's ability to adapt its structure to external market demands fosters EO, addressing uncertainties from rapid technological changes and market demands influenced by internal and external factors.

The EO developed based on Gen AI (Tran and Murphy, 2023), referring to the entrepreneurial mindset and skills fostered by individuals experienced with advanced AI, may help businesses leverage their innovative capabilities to adapt and thrive in volatility (Shepherd and Majchrzak, 2022). This includes navigating rapid market changes, responding to geopolitical shifts, embracing evolving technologies, and weathering economic crises. SIA (2023) reported that 44% of small business owners are likely to utilise Gen AI, reducing direct labour costs and increasing profit margins.

The direct impact of Gen AI on ER may be uncertain, but EO is likely to mediate a stronger indirect effect. This represents the effective

sequence of Gen AI and EO capabilities.

H3a. Entrepreneurial orientation mediates the effect of human skills on entrepreneurial resilience.

H3b. Entrepreneurial orientation mediates the effect of technology on entrepreneurial resilience.

H3c. Entrepreneurial orientation mediates the effect of data-driven culture on entrepreneurial resilience.

3.4. Moderating effect of market turbulence on the path joining entrepreneurial orientation (EO) and entrepreneurial resilience (ER)

"Market turbulence" refers to unpredictable and abrupt changes in market conditions and customer preferences that impact businesses of all sizes (Sun and Govind, 2017). Existing literature presents two debates on the effect of market turbulence on the link between dynamic capabilities and competitive advantage (Kachouie et al., 2018). The views are divergent, with little correlation (Zhou et al., 2019). One group of researchers debates whether organisations should invest in building dynamic capabilities (Helfat et al., 2009; Zahra et al., 2006), while others argue that existing capabilities might not suffice to match fast-evolving market demands (Ulrich and Smallwood, 2004; Schilke, 2014).

When an organisation faces high market turbulence, investing in dynamic capabilities has potential benefits (Chen et al., 2016). However, in low market turbulence, these benefits are minimal due to increased costs, resulting in lower profit margins (Wang et al., 2015).

Market turbulence significantly influences EO, which measures a company's inclination towards innovation and risk-taking (Kam-Sing Wong, 2014). In turbulent markets, businesses with strong EO adapt quickly to changing circumstances and capitalise on new opportunities (Kraus et al., 2012; Rank and Strenge, 2018). Market turbulence also plays a crucial role in building ER, the ability to withstand and recover from adverse situations like economic downturns, natural disasters, or sudden market shifts (Salvato et al., 2020; Miklian and Hoelscher, 2022). Navigating market turbulence helps businesses develop the skills, strategies, and resources needed to become more resilient and better cope with future challenges (Iborra et al., 2020). Based on these discussions, we hypothesise.

H4. Market turbulence (MT) positively moderates the path connecting EO and ER.

4. Research design

We used a survey-based method to test our theoretical model. To ensure the accuracy and comprehensiveness of the survey, we conducted an extensive literature review to select appropriate measures (Malhotra and Grover, 1998). In addition, we conducted qualitative interviews with 11 managers who were the owners or the heads of the IT departments of their organisations to gather feedback and insights, which helped us refine and modify the survey instrument (see Churchill, 1979). We adjusted the construct items based on our input to ensure their suitability for our case. For example, we adopted the measures for human skills, technology, and data-driven culture from previous studies. The topic of Gen AI is still in its early stages, so we did not have appropriate measures for the study. Instead, we used previous scales to measure AI capability and made minor edits based on input from qualitative interviews with experts. The experts we identified are senior executives working in reputable tech companies and are currently involved in Gen AI projects. We used a reflective construct approach to measure our construct, allowing us to investigate the relationships between the construct and other variables in our study. This approach gave us a deeper understanding of the underlying factors influencing the construct (see Appendix A). In the following section, we will discuss each construct and its items.

4.1. Measures

4.1.1. Generative AI (Gen AI)

As part of our extensive study on Artificial Intelligence (AI), we have undertaken a new research project that focuses specifically on Gen AI, an emerging area of AI research that has the potential to transform the way businesses operate. Researchers have often used AI and Gen AI interchangeably, which has contributed to confusion and a lack of clarity around the unique characteristics of Gen AI. We have developed a new scale tailored to Gen AI to address this issue, highlighting its unique features. To create this new scale, we started by modifying the existing AI scale developed by Mikalef and Gupta (2021) to better reflect the specific characteristics of Gen AI. We then sought input from consultants and senior managers with experience working on projects using Gen AI in real-world business settings. Their valuable insights allowed us to refine our scale and ensure that it was comprehensive and accurate, capturing the full range of features and capabilities of Gen AI. Our research aims to highlight the potential of Gen AI to transform businesses and industries in various ways. Our new scale represents a significant step forward in this direction, providing businesses with a valuable tool to assess their readiness for Gen AI and identify areas where they may need to focus their efforts to fully realise this technology's benefits. In conceptualising Gen AI, we have identified three underlying dimensions that are critical to its success: (a) human skills, (b) technology, and (c) data-driven culture. By focusing on these dimensions, we believe that our new scale captures the full range of features and capabilities of Gen AI and provides businesses with a comprehensive tool to assess their readiness for this emerging technology.

4.1.2. Entrepreneurial orientation (EO)

To create our measure of entrepreneurial orientation, we conducted extensive research on studies conducted by Matsuno et al. (2002) and Dubey et al. (2020). We carefully analysed and evaluated both studies' methodologies, frameworks, and findings to arrive at a comprehensive understanding of the concept of entrepreneurial orientation. Our measure has been designed by incorporating the most relevant and practical elements from these studies, and we believe it will provide valuable insights into the entrepreneurial orientation of small and medium enterprises. We have developed a four-item reflective construct that we think will help to capture entrepreneurial orientation in the digital environment accurately.

4.1.3. Entrepreneurial resilience (ER)

Entrepreneurial resilience is a complex construct that refers to the ability of small and medium-sized enterprises (SMEs) to adapt, adjust, and recover from challenges, setbacks, and crises. This construct is essential for SMEs because they often operate in uncertain, dynamic, and competitive environments that require them to be flexible, innovative, and agile. However, measuring entrepreneurial resilience is not straightforward as it involves multiple dimensions and factors that interact and influence each other. Prior studies have examined entrepreneurial resilience from an organisational resilience perspective, emphasising the importance of building and maintaining organisational capabilities, structures, and processes that can withstand and respond to internal and external shocks. However, recent research has highlighted the need to consider SMEs' unique characteristics and challenges, such as limited resources, lack of experience, and dependence on external networks. To develop a more comprehensive and context-specific measure of entrepreneurial resilience, we have critically reviewed and integrated insights from various studies, including Zighan et al. (2022), Khurana et al. (2022), and Fatoki (2018). Based on this review, we have proposed a four-item scale that captures the following dimensions of entrepreneurial resilience. These include adapting to change, being determined to achieve goals despite any obstacles, accepting failures as stepping stones, and being able to bounce back from initial failures. By

measuring these dimensions, our proposed scale provides a more nuanced and actionable assessment of entrepreneurial resilience. It can help SMEs and stakeholders identify their strengths and weaknesses, prioritise their investments and interventions, and enhance their long-term viability, growth, and impact.

4.1.4. Market turbulence (MT)

We developed a reflective construct consisting of three items that can be used to measure market turbulence accurately. This construct was built based on an in-depth critical review of existing literature, with specific emphasis on the works of Zhou et al. (2019) and Wang et al. (2015). Through our research, we sought to understand how market turbulence can influence entrepreneurial orientation and resilience in the digital environment. We identified key factors that contribute to market turbulence, such as rapidly changing customer preferences, the behaviour of new customers, and sudden changes in buying behaviour during times of crisis. By considering these factors, we developed a comprehensive construct that can accurately measure the level of turbulence in each market. Our research has significant implications for businesses operating in the digital landscape. By understanding the level of market turbulence in their respective industries, companies can better anticipate and adapt to changes in customer behaviour, market conditions, and other external factors that may impact their operations. This, in turn, can help businesses build more resilient and adaptive strategies that will enable them to thrive in an increasingly dynamic and competitive marketplace.

4.2. Data collection

As part of our research study, we surveyed senior managers of small and medium-sized enterprises (SMEs) in France. Our survey targeted the healthcare, agrifood, information and communication technology (ICT), environmental goods and services, and security sectors. We administered the survey to senior management teams in Montpellier, Toulouse, and Paris to gather insights into their perceptions of using Gen AI tools to build entrepreneurial capabilities during high uncertainty caused by the pandemic and geopolitical crises. Through the Business France initiative, we obtained samples and information about various firms, with the assistance of an anonymous individual working within the Government of France.

We collected comprehensive information, including company names and contact details, such as phone numbers, email addresses, and physical addresses. Our choice of France was based on the strong association with a Montpellier school specialising in SMEs, the significant role of SMEs in the national and European economy, and the innovative use of technology by French SMEs (Faquet and Malarde, 2020).

We distributed 124 questionnaires and received 87 completed responses, resulting in a 70.12% response rate (see Table 1). Our participants were diverse, with 25.29% from healthcare, 33.33% from agrifood, 19.54% from ICT, 11.49% from environmental goods and services, and 10.34% from security services. This diversity helps in understanding the representation of different industries in our sample.

Table 1
Sample Composition (N = 87).

Sector	Sample	%
Healthcare	22	25.29
Agrifood	29	33.33
ICT	17	19.54
Environmental goods and service	10	11.49
Security Services	9	10.34
Position of the respondent		
Head of R&D	23	26.44
Business Development Manager	18	20.69
Business Head	27	31.03
Relationship Manager	19	21.84

Additionally, 26.44% of respondents were heads of R&D, 20.69% were business development managers, 31.03% were business heads, and 21.84% were relationship managers.

To ensure our results were not impacted by non-response bias, we followed Armstrong and Overton's (1977) recommendations. We conducted a comparative analysis between early and late respondents using a *t*-test, which did not reveal significant differences ($p > 0.05$), suggesting non-respondents did not affect our sample. This finding gives us confidence in the accuracy of our data and results. We believe this data collection method is well-suited for this context, where Gen AI is a new technology, and only a few respondents have a comprehensive understanding of its application in business (see Liang et al., 2007; Fosso Wamba et al., 2023).

5. Data analyses and results

For our study on Gen AI, we faced the challenge of obtaining a large sample size due to the relative novelty of the phenomenon. We used the inverse square root method Kock and Hadaya (2018) suggested to address this issue and determine the sample size. We set our statistical power at 0.58, which falls within the range of 0.5–0.99 at a significance level of 0.05. This calculation led us to determine that we needed a sample size 88. We used the PLS-SEM technique, a flexible component-based approach to deal with complex models to test our theoretical model. Our choice of PLS-SEM was based on previous studies such as Liang et al. (2007), Kock and Hadaya (2018), Benitez et al. (2020), and Manley et al. (2021). In summary, our approach to determining the sample size considered the unique nature of our research topic while ensuring we had sufficient statistical power to draw meaningful conclusions.

5.1. Measurement model

During our analysis, we carefully examined various factors to determine the validity of the constructs used in the model. All the measurement items' factor loadings were more significant than 0.5, indicating a strong relationship with the underlying construct. Additionally, the scale composite reliability (SCR) value was more significant than 0.7, indicating that the measurement items were reliable and consistent in their measurements. The average variance extracted (AVE) value was more significant than 0.5, suggesting that the items consistently measured the same underlying construct (see Table 2). To ascertain the discriminant validity of the constructs, we examined the intercorrelation matrix. We observed that the values in the leading diagonal of the matrix's square root of AVE were more significant than those in the given row and column (see Table 3). This indicates that the constructs possess discriminant validity, measuring different underlying constructs. Therefore, we can say that the models used in this analysis possess sufficient convergent and discriminant validity, indicating that the constructs used are accurately measured and distinct (Fornell and Larcker, 1981).

We also conducted a test suggested by Henseler et al. (2015), which involves calculating the Heterotrait-Monotrait ratio (HTMT) for each pair of reflective constructs. HTMT is a ratio of the correlations between different constructs and the correlations between indicators of the same construct, with values below 0.90 (see Table 4) indicating sufficient discriminant validity. Considering the robust psychometric properties of our constructs, we are confident that they provide reliable and valid measures for estimating the structure.

5.2. Common method bias (CMB)

For our research, we utilised a single informant questionnaire to collect data from critical respondents, following the methodology adopted in prior studies by Srinivasan and Swink (2018) and Fosso Wamba et al. (2023). However, we are aware of the potential issue of

Table 2
Loadings of measurement items, Scale Composite Reliability and Average Variance Extracted (N = 87).

Construct	Items	Factor loadings	Variance	Error	SCR	AVE
HS (α = 0.93)	HS1	0.78	0.61	0.39	0.94	0.65
	HS2	0.73	0.54	0.46		
	HS3	0.86	0.74	0.26		
	HS4	0.81	0.66	0.34		
	HS5	0.85	0.72	0.28		
	HS6	0.81	0.66	0.34		
	HS7	0.85	0.72	0.28		
	HS8	0.76	0.57	0.43		
TECH (α = 0.86)	TECH2	0.71	0.50	0.50	0.85	0.54
	TECH3	0.77	0.59	0.41		
	TECH4	0.77	0.59	0.41		
	TECH6	0.74	0.55	0.45		
	TECH7	0.69	0.48	0.52		
DDC (α = 0.88)	DDC1	0.83	0.69	0.31	0.86	0.67
	DDC4	0.84	0.71	0.29		
	DDC5	0.78	0.61	0.39		
EO (α = 0.72)	EO1	0.75	0.57	0.43	0.83	0.55
	EO2	0.80	0.64	0.36		
	EO3	0.79	0.63	0.37		
	EO4	0.60	0.35	0.65		
ER (α = 0.83)	ER1	0.76	0.58	0.42	0.89	0.67
	ER2	0.83	0.69	0.31		
	ER3	0.84	0.70	0.30		
	ER4	0.84	0.70	0.30		
MT (α = 0.84)	MT1	0.86	0.74	0.26	0.90	0.76
	MT2	0.91	0.82	0.18		
	MT3	0.85	0.72	0.28		

Table 3
Discriminant validity (N = 87).

	HS	TECH	DDC	EO	ER	MT
HS	0.79					
TECH	0.55	0.74				
DDC	0.62	0.70	0.82			
EO	0.68	0.66	0.58	0.74		
ER	0.73	0.74	0.74	0.65	0.82	
MT	0.70	0.65	0.72	0.65	0.83	0.87

Table 4
HTMT values (good if < 0.90, best if < 0.85) (N = 87).

	HS	TECH	DDC	EO	ER	MT
HS						
TECH	0.87					
DDC	0.61	0.80				
EO	0.71	0.87	0.87			
ER	0.72	0.77	0.79	0.93		
MT	0.67	0.76	0.70	0.87	0.80	

common method bias, which can occur because of using a single source of information. To address this concern, we adopted measures recommended by prior research, including Podsakoff et al. (2003), Ketokivi and Schroeder (2004), and Hulland et al. (2018). We also followed the guidelines provided by MacKenzie and Podsakoff (2012) to ensure that our instruments were pretested and contained no double-barrelled statements or ambiguous questions. By taking these precautions, we aimed to minimise any potential sources of bias and increase the validity of our results.

We used Harman's one-factor test to assess the common method bias (CMB). This technique is commonly used to identify a single factor that can explain the variations in a set of variables. To do this, we utilised exploratory factor analysis, a statistical method that helps uncover underlying patterns in the data. Our analysis showed that no single factor accounted for more than 30% of the total variance in the variables. However, caution needs to be applied regarding this approach, as other factors might also affect the variables (see Hulland et al., 2018, p. 102). To address this concern, we used the correlation marker technique, which involves adding highly correlated markers with the construct of interest. This reduces the risk of overreliance on a single factor and ensures a more accurate analysis. Lindell and Whitney (2001) proposed this method, which effectively mitigates potential issues with the one-factor test. By using both the one-factor test and the correlation marker technique, we were able to conduct a comprehensive analysis and arrive at more reliable conclusions.

5.3. Hypothesis testing

Fig. 2 displays estimates from a Partial Least Squares Structural Equation Modelling (PLS-SEM) analysis using WarpPLS 7.0, developed by Kock and Hadaya (2018). The R^2 value of 0.52 indicates the model explains about 52% of the variation in entrepreneurial resilience (ER), suggesting a good fit and significant explanatory power (Hair et al., 2013). The results support the hypothesised mediating role of entrepreneurial orientation (EO) between Gen AI and ER, highlighting EO as a crucial mechanism through which Gen AI influences ER. This underscores the importance of developing EO as a critical capability to enhance entrepreneurial resilience in facing challenges and uncertainties. Gen AI explains nearly 48% of the variation in EO (R^2 = 0.48) (see Fig. 3).

Our research hypotheses are supported by the data (see Table 5). Specifically, there is a statistically significant positive relationship between three strategic resources—human skills (HS), advanced technology (TECH), and data-driven culture (DDC)—and EO. Hypothesis H1a (HS → EO) ($\beta = 0.24$, $p < 0.01$) shows that high levels of human skills positively associate with EO. Hypothesis H1b (TECH → EO) ($\beta = 0.17$, $p < 0.05$) indicates that advanced technology positively impacts EO. Hypothesis H1c (DDC → EO) ($\beta = 0.37$, $p < 0.01$) shows that a data-driven culture significantly and positively affects EO. Bundling these three resources creates Gen AI, which positively influences EO. In other words, combining HS, TECH, and DDC helps firms develop a culture of entrepreneurship that fosters innovation and growth.

Hypothesis H2 (EO→ER) ($\beta = 0.57$, $p < 0.01$) is supported, suggesting EO plays a crucial role in fostering ER during crises. Firms with high EO levels are better equipped to withstand and adapt to disruptions, increasing their chances of long-term success.

Hypothesis H3 (MT*EO→ER) is not supported ($\beta = -0.22$, $p < 0.02$), indicating the moderating effect of market turbulence (MT) on the path between EO and ER is negative. The findings suggest highly turbulent markets pose unique challenges to the effectiveness of dynamic capabilities. Matching new and uncertain situations with organisational changes is complex, potentially decreasing the ability to adapt quickly and leading to ineffective strategies due to unfamiliarity with new circumstances. In dynamic environments, significant changes are needed to stay competitive, but experience-based adaptation can create inertia, making necessary changes difficult to implement. This suggests market turbulence affects both the potential for change and an organisation's ability to take advantage of opportunities through routine-based change, integrating perspectives from different research views on market turbulence's impact (Wang et al., 2015).

Schilke (2014) argues that when market turbulence is low, dynamic capabilities' potential is limited due to fewer opportunities to utilise them, reducing organisational routines for adapting the resource base. When environmental dynamism is high, dynamic capabilities may have less impact on competitive advantage despite the opportunities for resource reconfigurations, as unexpected events and discontinuous change make routine-based activities challenging (Li and Liu, 2014; Girod and Whittington, 2017).

The results show high MT negatively moderates the relationship between EO and ER, challenging the linear relationship assumption between market turbulence and dynamic capabilities (Wang et al.,

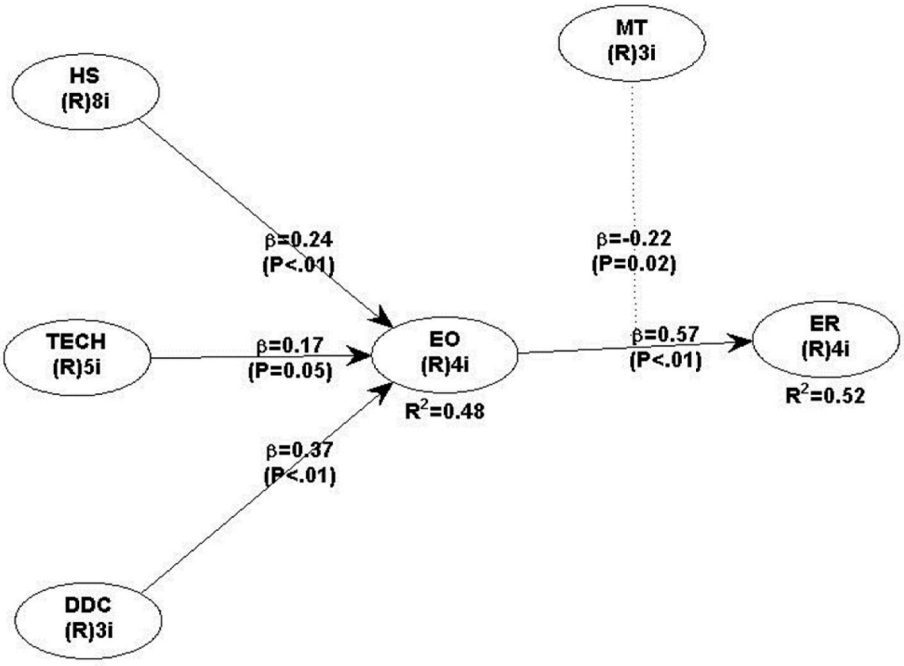

Fig. 2. Final Model based on PLS-SEM using WarpPLS 7.0.

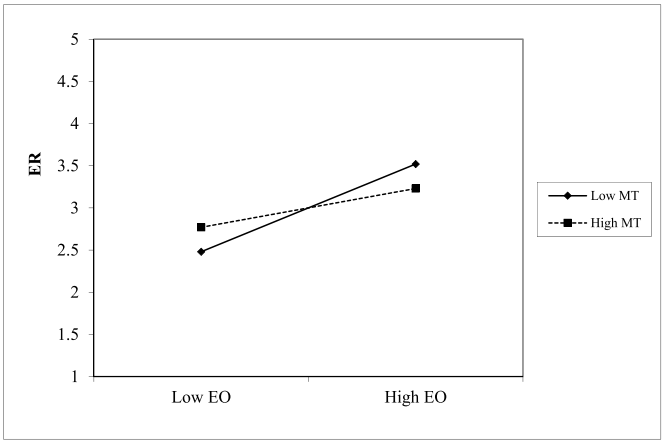

Fig. 3. Interaction graph-entrepreneurial resilience.

Table 5
Hypotheses testing (N = 87).

Hypothesis	Driving variable	Outcome Variable	β	p-value	Results
H1a	HS	EO	0.24	<0.01	supported
H1b	TECH	EO	0.17	<0.05	supported
H1c	DDC	EO	0.37	<0.01	supported
H2	EO	ER	0.57	<0.01	supported
H3	EO*MT	ER	−0.22	<0.02	Not supported

2015). Building on Schilke's (2014) arguments, we suggest the relationship between MT and dynamic capabilities is non-linear, warranting further investigation. A longitudinal study is recommended to capture this relationship's nature better.

We examined EO's mediating effect (H4) using Kock's (2014) procedure, based on Hayes and Preacher (2010) methods, and considered more reliable than Baron and Kenny's (1986) approach. Kock's mediation test, using WarpPLS 7.0 (see Appendix B), provides information on the sum of indirect effects, path segments, P values, standard errors, and effect sizes (f^2) as per Cohen (1988) (Moqbel et al., 2020). Results indicate EO has partial mediation effects (HS→EO→ER), (TECH→EO→ER), and (DDC→EO→ER), supporting H4a, H4b, and H4c.

6. Discussions

Gen AI and entrepreneurial orientation (EO) have the potential to transform SMEs and micro-firms by equipping them with analytical tools, fostering innovation, proactivity, and risk-taking (Abaddi, 2023; Hughes et al., 2022). Our study aimed to understand the impact of Gen AI and EO on entrepreneurial resilience (ER). We established that combining EO with Gen AI forms a dynamic capability, supporting ER based on the contingent view of dynamic capability (Schilke, 2014; Fainshmidt et al., 2016). We also explored how market turbulence affects dynamic capabilities, opening avenues for further research on EO's impact on ER under changing conditions. We conducted surveys among SMEs in France, focusing on those adopting Gen AI tools, as they are early adopters of new technology but face unique challenges.

Our findings show that EO partially mediates the relationship between Gen AI and ER, indicating both direct and indirect effects (see Appendix B). Gen AI, which combines human skills, technology, and a data-driven culture, directly and indirectly impacts ER through EO. This aligns with the hierarchical dynamic capability perspective (Winter, 2003; Schilke, 2014; Fainshmidt et al., 2016), suggesting that organisations invest in higher-order capabilities based on market conditions to gain a competitive edge.

This deepens our understanding of EO as a dynamic organisational capability (Wiklud & Shepherd, 2003; Zahra et al., 2006; Dubey et al., 2020). Harnessing Gen AI tools can develop EO, facilitating ER under varying market conditions. Our analysis reveals a significant positive correlation between human skills (HS), technology (TECH), and data-driven culture (DDC) with EO, as hypothesised in H1 (Fig. 2). Integrating HS, TECH, and DDC helps companies cultivate an entrepreneurial culture that promotes innovation and growth.

Our second hypothesis indicates that EO is crucial for promoting ER during economic crises (Table 5). Companies with high EO levels can adapt to unforeseen challenges, enhancing their long-term survival and success. However, our third hypothesis (H3) does not support the claim

that EO strongly influences ER under high market turbulence. This finding contrasts with some scholars who argue that high dynamism enhances EO's effect on ER (Bullough and Renko, 2013) but aligns with others who suggest high market turbulence may not positively influence dynamic capabilities and competitive advantage (Schilke, 2014).

Our study contributes to the literature by focusing on the development of ER through EO and Gen AI based on the dynamic capabilities view (DCV). We explored how Gen AI influences EO and the mechanisms through which dynamic digital capabilities impact ER (Dubey et al., 2020). Our findings suggest that embracing Gen AI to enhance EO supports achieving ER. While existing work on ER has primarily focused on EO (Wiklud & Shepherd, 2003; Zahra et al., 2006), the integration of Gen AI remains relatively unexplored. Our study demonstrates EO's crucial role as a dynamic capability, influenced by Gen AI and market turbulence, in enhancing ER.

6.1. Implications for theory

This research study investigates how small and medium-sized enterprises (SMEs) in France perceive the potential use of Gen AI to improve their entrepreneurial capabilities and address uncertainties in the market. To achieve this, data was collected through a survey-based instrument designed to capture the opinions and insights of SMEs on how Gen AI can help them overcome challenges and improve their business operations. The study considers various factors, such as the scale of the operations, the industry in which it operates, and the level of awareness and understanding of Gen AI among SMEs (Abaddi, 2023; Tran and Murphy, 2023).

The study aims to comprehensively understand how Gen AI can benefit SMEs in France and contribute to their growth and success in the marketplace. The findings of the study offer two main contributions. Firstly, this study uses dynamic capability theory to develop research hypotheses and test them using survey data. The aim is to understand how Gen AI, as an organisational capability, can enhance entrepreneurial orientation and resilience. Secondly, the study focuses on how Gen AI can detect threats and opportunities and guide organisations in reconfiguring their resources and capabilities. By sensing opportunities, Gen AI can help firms transform them into competitive advantages, leading to improved performance and sustained success in an increasingly competitive business environment.

The study suggests that firms that leverage Gen AI's capabilities are better equipped to adapt to changing market conditions and maintain a competitive edge. However, it is essential to note that careful consideration must be given to the ethical implications of leveraging Gen AI to achieve such benefits (Norbäck and Persson, 2024).

The study investigates how SMEs in France have built dynamic capabilities to respond to market turmoil and enhance entrepreneurial resilience. The main contribution of this study is to develop and test a novel framework that integrates entrepreneurial orientation (EO) and Gen AI in the context of entrepreneurial resilience, which has not been explored in previous literature. By doing so, the study provides empirical evidence on how EO and Gen AI influence entrepreneurial resilience and how market turbulence moderates this relationship. The findings build upon the arguments put forth by previous scholars and extend the scope to Gen AI (see Rizomyliotis et al., 2022; Shepherd and Majchrzak, 2022; Kanbach et al., 2024; Xia et al., 2024).

Furthermore, the study provides a detailed understanding of the mediating and moderating mechanisms of EO and market turbulence and the relationship between Gen AI and entrepreneurial resilience. Therefore, the findings contribute to the ongoing discussion on how dynamic capabilities might improve entrepreneurial resilience, with the understanding that the effectiveness of these qualities may vary depending on the organisational context and market scenario.

This research contributes significantly to the ongoing theoretical discourse within the realm of entrepreneurship and information management. Given the current stage of development, these contributions hold particular importance. Entrepreneurial orientation has long been a focal point within entrepreneurship theory. However, the comparatively unexplored intersection of Gen AI and its influence on entrepreneurial orientation requires a more rigorous empirical exploration to effectively broaden the theoretical scope. We believe that our contribution has played a modest role in advancing the ongoing discussion at the intersection of entrepreneurship theory and technological innovation. Our efforts have introduced new perspectives, drawn attention to critical issues, and provided valuable insights that have enriched the discourse in these fields.

6.2. Implications for managers

The study has significant implications for managers leveraging Gen AI to enhance their entrepreneurial resilience (ER) during market turmoil. It shows how small and medium-sized enterprises (SMEs) in France have developed dynamic capabilities by integrating three strategic Gen AI resources: human skills (HS), technology (TECH), and data-driven culture (DDC), to foster an entrepreneurial orientation (EO). EO helps managers promote innovation, expansion, and adaptation amid uncertainties and challenges. Managers should also be aware of the negative moderating effect of market turbulence (MT) on the relationship between EO and ER and mitigate its impact by developing emotional and psychological coping strategies. Additionally, they should consider the ethical and social implications of using Gen AI in their entrepreneurial activities, ensuring responsible and transparent use.

The study provides a conceptual model explaining how Gen AI influences ER through the mediation of EO and the moderation of MT. This model can inspire managers or policymakers to invest in dynamic capabilities to enhance ER and adjust their strategies in response to volatile market conditions. Embracing EO and Gen AI can improve ER and enhance long-term survival and prosperity. However, without understanding the market context, organisations may not fully recognise the potential advantages of Gen AI and EO. Grover and Sabherwal (2020) asserts that a primary obstacle, especially for conventional firms, is the need to alter their digital mindset.

Interestingly, our study found that a data-driven culture (DDC) in SMEs significantly and favourably impacts EO. Organisations must transition from conventional methods of resolving disputes to digital ones to foster such cultures. This shift enables engagement with partners and stakeholders, ongoing assessment of IT system effectiveness, and the implementation of adaptable strategies, ultimately enhancing entrepreneurial resilience.

6.3. Implications for policymakers

The research study offers valuable insights that can guide policymakers in formulating effective strategies to help small businesses across various industries adopt AI technology. With the emergence of Gen AI, there are vast opportunities to explore, however, it is equally important to address the potential negative impacts of this technology. It is crucial to note that the quality of the insights is contingent upon the quality of the training data. Therefore, policymakers should prioritise supporting research initiatives that aim to comprehend the potential benefits of incorporating Gen AI into the business world to gain a competitive edge. Policymakers should also consider the potential drawbacks associated with this technology to make informed decisions. The research findings provide a comprehensive framework that policymakers can use to evaluate the potential pitfalls associated with the adoption of AI technology, while also taking advantage of the vast opportunities it presents.

6.4. Limitations of the study and future research direction

Although our study provides significant theoretical and managerial insights, it has certain limitations. First, we based our arguments on the

dynamic capability approach, which is crucial for attaining competitive advantage and ER (Ferreira et al., 2022). However, we acknowledge that dynamic capability assumptions may not apply in all crises (Dubey et al., 2023). We also consider the Organisational Information Processing Theory (OIPT) by Galbraith (1974), which emphasises the role of OIPT in dealing with environmental uncertainty and improving performance. From the OIPT perspective, market turbulence (MT) may necessitate processing information from uncertain market conditions, motivating organisations to seek new knowledge and enhance decision-making, thereby fostering entrepreneurial resilience.

Second, while we agree with Flynn et al. (1990) that a survey-based methodology is effective for investigating our research objectives, survey-based research has drawbacks, such as errors from subjectivity and bias (Boyer and Swink, 2008). Despite efforts to minimise non-response and common method biases, a longitudinal study would enhance the validity of the findings. Future studies should randomly contact a sample of respondents to gain further insights into Gen AI, EO, and their impact on ER.

Third, using samples from one economy may limit our findings' applicability. We chose France due to cultural, economic, and legal constraints. Fourth, future research could employ a multi-case methodology to understand Gen AI as a dynamic capability. Fifth, as Dubey et al. (2023) note, culture significantly influences government policies. Therefore, exploring how cultural factors impact entrepreneurs' mindsets, technological investments, and societal digitalisation to enhance resilience would be valuable. Sixth, longitudinal research should investigate the dynamic nature of implementing digital technologies and their connection to resilience and performance.

Lastly, we did not measure Gen AI's impact on other resilience parameters, focusing solely on entrepreneurial resilience. Other factors, such as negative emotional responses during turmoil, could interfere with developing ER (Shore et al., 2023).

Future research could explore how EO and Gen AI interact and influence ER in different organisational contexts and market scenarios. It could also examine the role of emotions and psychological factors on ER, such as how negative emotional responses during turmoil affect resilience development and how positive emotions like optimism and hope could enhance resilience. Finally, future research could investigate the ethical and social implications of using Gen AI in entrepreneurship, including its effects on decision-making, creativity, innovation, and the broader impact on stakeholders and society.

7. Concluding remarks

The ongoing progress of digital technologies has revolutionised the corporate landscape and generated many prospects, resulting in novel avenues for entrepreneurial pursuits (Lamine et al., 2023). Resilience in entrepreneurship refers to the capacity to respond and effectively adjust a business in the face of challenges and unpredictability (Korber and McNaughton, 2018). EO effectively uses an entrepreneurial attitude to enhance technology and business performance (Seo and Park, 2022). This study examines resilience as a reaction to market turbulence and investigates how accomplished businesses cultivate resilience through digitalisation and technological advancements within the pandemic. More precisely, we uncover the Gen AI and entrepreneurial orientation entrepreneurs employ to cultivate entrepreneurial resilience and rapidly transform their businesses. We investigated further how MT influences the relationships between joining EO and ER. Our study makes two contributions to the field of DCV. Our work offers empirical evidence that supports the two fundamental theoretical principles of dynamic capabilities. Our study reveals that combining Gen AI and EO has a notable and constructive impact on entrepreneurial resilience. We have successfully demonstrated the moderating influence of market turbulence as the second notion.

Previous research has investigated the impact of digital progress during the COVID-19 pandemic (Vasi et al., 2024; Li et al., 2022). Nevertheless, in our situation, we extended the second theoretical principle by investigating the moderating influence of market turbulence, which is contingent upon several aspects, including dynamic shifts in customer preferences, the behaviour of new customers, and abrupt changes in purchasing patterns at specific periods. Our efforts have focused on addressing the ongoing disparity by doing a thorough study to analyse the potential impact of Gen AI on ER. We are confident that our research findings and the study's limitations will provide fresh opportunities for further research.

CRediT authorship contribution statement

Adam Shore: Writing – review & editing, Writing – original draft, Resources, Methodology, Conceptualization. **Manisha Tiwari:** Writing – review & editing, Writing – original draft, Visualization, Validation, Project administration, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Priyanka Tandon:** Writing – review & editing, Writing – original draft, Visualization, Project administration. **Cyril Foropon:** Resources, Data curation.

Declaration of competing interest

None.

Data availability

Data will be made available on request.

Appendix A. Measurement Scales

Scale	Items
Human Skills (HS)	Our IT staff possess adequate skills in processing data and analysing them (HS1)
	We provide our IT staff with the required training to deal with Generative AI applications (HS2)
	We hire our IT team based on recent requirements for AI skills (HS3)
	Our IT staff have suitable work experience to fulfil their job (HS4)
	Based on their business knowledge, our managers use Generative AI-based inputs to make appropriate decisions (HS5)
	Our managers work with the IT team, other employees, and customers to understand the opportunities or threats that can be addressed using Generative AI solutions (HS6)
	Our managers have an in-depth understanding of business (HS7)
	Our managers have a good sense of where to apply Generative AI (HS8)
	The IT team head leading the Generative AI has strong leadership skills (HS9)
	Our managers can anticipate the future business needs of functional managers, suppliers and customers and proactively design Generative AI solutions to support these needs (HS10)
Technology (TECH)	We have built scalable data storage infrastructures (TECH1)

(*continued on next page*)

(*continued*)

Scale	Items
	We have invested in advanced cloud services to allow complex AI abilities on simple API calls (e.g., Microsoft Cognitive Services, Google Cloud Vision) (TECH 2)
	We have invested in distributed and parallel computing for Generative AI data processing (TECH 3)
	We have explored AI infrastructure to ensure that data is secured from end to end with state-of-the-art technology (TECH 4)
	We have allocated the desired funds to upgrade our Generative AI capabilities (TECH 5)
	We are investing in recruiting teams to support the Generative AI initiatives (TECH 6)
	We believe that sufficient time must be given to develop Generative AI capabilities (TECH 7)
Data-Driven Culture (DDC)	We consider data and output obtained through Generative AI as an asset (DDC1)
	We base our decisions on data rather than on instinct (DDC2)
	We give preference to data over intuition while making decisions (DDC3)
	We continuously assess and improve the business rules in response to insights extracted from Generative AI after careful evaluation by our business managers (DDC4)
	We continuously coach our employees to make decisions based on AI-driven insights (DDC5)
Entrepreneurial Orientation (EO)	We believe that the high level of uncertainty in the market is an opportunity for us (EO1)
	We are highly positive as we believe in gaining an advantage out of turbulence (EO2)
	We believe in building a risk management approach (EO3)
	The senior members of the organisation are highly supportive of the Generative AI initiative (EO4)
Entrepreneurial Resilience (ER)	We can adapt to any dynamic changes (ER1)
	We are determined to achieve our goals despite any level of obstacles we face (ER2)
	We fear no failures as failures help to correct our mistakes and allow us to make better decisions in future (ER3)
	We will bounce quickly from initial failures (ER4)
Market Turbulence (MT)	Customers are becoming far more demanding with time (MT1)
	Competition in our market is cutthroat (MT2)
	The technology in our industry is changing rapidly (MT3)

Appendix B. Indirect Effects (mediation test based on Kock, 2014)

Indirect effects for paths with 2 segments						
	HS	TECH	DDC	EO	ER	MT
ER	0.035	0.042	0.003			0.064
Number of paths with 2 segments						
	HS	TECH	DDC	EO	ER	MT
ER	1	1	1			1
	HS	TECH	DDC	EO	ER	MT
ER	0.318	0.287	0.484			0.194
Standard errors of indirect effects for paths with 2 segments						
	HS	TECH	DDC	EO	ER	MT
ER	0.074	0.074	0.075			0.074
Effect sizes of indirect effects for paths with 2 segments						
	HS	TECH	DDC	EO	ER	MT
ER	0.026	0.031	0.002			0.053
Sums of indirect effects						
	HS	TECH	DDC	EO	ER	MT
ER	0.035	0.042	0.003			0.064
Number of paths for indirect effects						
	HS	TECH	DDC	EO	ER	MT
ER	1	1	1			1
	HS	TECH	DDC	EO	ER	MT
ER	0.318	0.287	0.484			0.194
Standard errors for sums of indirect effects						
	HS	TECH	DDC	EO	ER	MT
ER	0.074	0.074	0.075			0.074
Effect sizes for sums of indirect effects						
	HS	TECH	DDC	EO	ER	MT
ER	0.026	0.031	0.002			0.053
Total effects						
	HS	TECH	DDC	EO	ER	MT
EO	0.207	0.246	0.018			0.375
ER	0.035	0.042	0.003	0.17		0.777
Number of paths for total effects						
	HS	TECH	DDC	EO	ER	MT
EO	1	1	1			1
ER	1	1	1	1		2

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