Gordon Institute of Business Science
University of Pretoria

The Moderating Role of Technological Turbulence on Entrepreneurial Orientation and Organisational Ambidexterity

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15 November 2022

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ABSTRACT

The failure rate of small, medium and micro enterprises (SMMEs) in South Africa is alarming. Added to tough economic conditions in the country, and the lacking financial and management skills among many of these entrepreneurs, the unprecedented rate of technological changes alters the entrepreneurial landscape. Therefore, the notion of entrepreneurial orientation has become fundamental in developing entrepreneurial thinking and making strategic choices with the aim of exploring and exploiting new opportunities in a changing context. Yet, this process takes place in a state of organisational ambidexterity. Therefore, this study sought to determine whether entrepreneurial orientation is a precursor of organisational ambidexterity. Technological turbulence was introduced in the study to examine whether it has a moderating effect on the relationship between entrepreneurial orientation and organisational ambidexterity in a sample of 166 SMMEs. This descriptor-explanatory quantitative study used the confirmatory factor analysis and correlation matrix to examine the relationship between constructs. The study found a strong correlation between entrepreneurial orientation and organisational ambidexterity. However, technological turbulence had no moderating effect on the relationship between entrepreneurial orientation and organisational ambidexterity. Therefore, the findings suggest that while SMMEs are ambidextrous organisations, the lack of a positive moderating role by technological turbulence suggests that this could be one of the many contributing factors that lead to the high failure rate of SMMEs.

KEY WORDS

Entrepreneurial Orientation; Organisational Ambidexterity; Exploration and Exploitation; Technological turbulence

DECLARATION

I declare that this research project is my own work. It is submitted in partial fulfilment of the requirements for the degree of Master of Business Administration at the Gordon Institute of Business Science, University of Pretoria. It has not been submitted before for any degree or examination in any other University. I further declare that I have obtained necessary authorisation and consent to carry out this research.

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CHAPTER 1 – THE RESEARCH PROBLEM

1.1. Introduction

Entrepreneurial orientation is a key concept that enables organisations to make strategic choices with the aim of exploring and exploiting new opportunities that other firms cannot exploit (Covin & Wales, 2019; Rosenbusch et al., 2013). This process occurs in a state of organisational ambidexterity. Technological turbulence is a phenomenon that unlocks opportunities and presents potential threats to organisations (Birkinshaw & Gibson, 2004; Covin & Wales, 2019).

The research study addresses an academic gap the researcher identified regarding the moderating role of such technological turbulence, and specifically, what its relationship is between entrepreneurial orientation and organisational ambidexterity. Chapter 1 introduces the research study; it presents the background and context, which is followed by the research problem, the research scope, the identified objectives and resulting research questions. It also introduces the significance of the study and its limitations. The chapter concludes with a structural outline of the research paper.

1.2. Background

Entrepreneurship is a significant contributor to the alleviation of poverty, and an enhancer of job creation, economic growth and development (Bosma et al., 2018; Bowmaker-Falconer & Herrington, 2020). It is encouraged and supported across the world, and international institutions and governments have shown an increasing interest in the functional role of small, medium, and micro enterprises (SMMEs), as they are believed to generate economic growth and development (Bosma et al., 2018; Bowmaker-Falconer & Herrington, 2020). Therefore, the creation of new small businesses, the survival and the success of all existing SMMEs is vitally important for the South African and the global economy.

SMMEs' challenges, however, are how to advance their entrepreneurial thinking to shape and influence their future in the face of technological turbulence (Lee & Csaszar, 2020; Rose & Mamabolo, 2019). The entrepreneurial thinking skills can be cultivated and advanced through entrepreneurial orientation, which is defined as a strategy-making process by which a set of choices are made and activities are executed with the intention of creating new or significantly improved products and a sustainable competitive advantage (Lomberg et al., 2017; Rose & Mamabolo, 2019). Miller (1983) introduced the concept of entrepreneurial orientation and defined it as a three dimensional concept, which he described as a firm'sstrong commitment to product and technological innovation, risk-taking, and proactiveness (Mckenny et al., 2018), which Covin and Wales (2019) and Lomberg et al. (2017) describe as a unidimensional construct. The

dimension of innovativeness involves experimentation is operationalised “through examining the frequency of new products and service offerings” introduced by SMMEs in the marketplace (Covin & Wales, 2019, p. 10). Risk-taking refers to the firm’s willingness to commit a significant amount of resources, while there is still the possibility of failure (Lumpkin & Dess, 1996). Proactiveness can be defined as an act of anticipation and responding to problems and changes before they become a threat to the viability of a business (Covin & Lumpkin, 2011; Lumpkin & Dess, 1996).

Caused by the increasingly important role of SMMEs towards job creation and a sustainable economy, the academic conversation on entrepreneurial orientation has gained significant momentum over the years (Covin & Wales, 2019), and its landmarks include “the defining pieces, methods and measurements, contingencies, and impact” (Wales et al., 2021, p. 564). These measurements and contingencies are a part of the entrepreneurial construct, with multiple outcomes on a firm’s performance, which include a firm’s growth in market share, annual sales, profits and the return on capital invested.

Entrepreneurial orientation exhibits characteristics of organisational ambidexterity (Rosenbusch et al., 2013). Organisational ambidexterity is defined as “the ability of an organisation to simultaneously pursue both explorative (discontinuous) and exploitative (incremental) innovation” (Junni et al., 2013, p. 299). While both aspects are important parts of a firm’s processes, too much exploration drives out exploitation and vice versa (Gupta et al., 2006). The two functions are distinct and opposing continuums of organisational ambidexterity (Gupta et al., 2006). Exploration is associated with the search of new opportunities and experimentation, and it is linked to new activity areas that are detached from the firm’s current core competencies. This results in risk and uncertainty in its outcomes, caused by the possibility of failure (Jansen, van den Bosch et al., 2006; Wiklund & Shepherd, 2011).

Exploitation involves refinement and improvement of current product-market offerings (Jansen et al., 2006) in an effort to maximise the firm’s success in the market. It is is associated with the search of new opportunities and experimentation with new products, (Jansen, van den Bosch et al., 2006; Wiklund & Shepherd, 2011). It involves activities that hone the firm’s core competencies and efficiently refine its currently existing products (Jansen et al., 2006). Combining these two functions or possessing organisational ambidexterity enables SMMEs to shape their future and ensure their survival in the face of technological turbulence.

The extant literature posited that entrepreneurial orientation was “more closely aligned with the activities” of organisational ambidexterity, because its dimensions are closely associated with

experimental activities (Covin & Wales, 2019; Wiklund & Shepherd, 2011, p. 930). On the other hand, other scholars are of the view that entrepreneurial orientation influences the strategic decisions that favour both exploitation and exploration, which occurs in a state of ambidexterity (Rosenbusch et al., 2013). This conundrum led to the need to conduct a study with the aim of clarifying the relationship between entrepreneurial orientation and organisational ambidexterity (Covin & Wales, 2019).

Many factors have an impact on the relationship between entrepreneurial orientation and organisational ambidexterity. Technological turbulence can be defined as "the rate of technological change and unpredictability, which is characterised by the instability and rapid obsolescence of technologies" (Wang et. al., 2022, p. 1440). The constant emergence of new technologies is a dynamic force, which is transforming societies and key business operations, and is affecting processes and business concepts (Jafari-Sadeghi et al., 2021). Businesses' failure to adapt to technological turbulence has proven to be a major cause of those firms' obsolescence and extinction (Christensen et al., 2018; Tripsas & Gavetti, 2000). Therefore, by default, SMMEs will be forced to adapt to modern technologies and leverage these to take advantage of the opportunities they present to shape and influence their organisations' future.

In summary, SMMEs are vital to South Africa's sustainability, because they contribute towards job creation, economic growth and development. However, despite their important role, SMMEs are faced with technological turbulence that presents potential threats, although it also enables the emergence of new opportunities for their organisations' growth and survival. Therefore, it is imperative for SMMEs to adopt cutting-edge technologies that will allow them to shape and influence their future through entrepreneurial orientation and organisational ambidexterity.

1.3. Business Problem

South Africa is confronted with a crisis of high levels of unemployment and continuing inequality, where the youth are the most affected group. For instance, in the first quarter of 2022, the youth unemployment rate was soaring to 75.1%, while the national unemployment rate stood at 34.5% (Statistics South Africa, 2022). The youth are a very important part of any society and economy, as they provide the future leaders and future workforce. While the formal business sectors are unlikely to create the number of jobs necessary to provide work for the growing youth segment, the creation of SMMEs, especially by the youth, will be very important, because SMMEs are significant contributors to job creation, alleviation of poverty and economic growth and development, and benefits for the population of any country (Bowmaker-Falconer & Herrington, 2020).

However, entrepreneurial intentions in South Africa are somewhat discouraging for aspirant entrepreneurs, as the business discontinuance rate increased to 4.9% in 2019, which is higher than the reported established business ownership rate of 3.5% (Bowmaker-Falconer & Herrington, 2020). This implies that more SMMEs close down than are created, indicating a net shrinking segment. This trend is very concerning, especially if one considers the high unemployment levels in the country. Bushe (2019) corroborates this finding by confirming that "There is a very high rate of business failure among SMMEs in South Africa" (p. 1). Dele-Ijagbulu et. al., (2020) echoed the same view and accentuates that the rate of failure of SMMEs, in South Africa, is alarming. Research indicates that, amongst other reasons, 36.6% of business discontinuance is attributed to uncompetitive products, a lack of entrepreneurial knowledge and skills (Bowmaker-Falconer & Herrington, 2020) to navigate turbulent and competitive environments. In most cases, business failure is caused by poor or lacking financial planning, and a lack of thorough market assessment or research prior to launching into their new venture.

Technological turbulence is constantly transforming society and changing the entrepreneurial landscape (Akpan et al., 2021; Jafari-Sadeghi et al., 2021). The velocity and magnitude of changes in technology are also unprecedented (Jafari-Sadeghi et al., 2021). Therefore, to effectively compete and survive in such an environment, SMMEs will have to understand the new 'rules of the game' and sharpen their entrepreneurial skills. For example, emerging technologies such as the Internet of Things (IoT) have gained momentum in their adoption rate, especially in the domain of Industry 4.0 (Kahle et al., 2020). Incremental thinking on its own will lead SMMEs to cannibalisation, if they are not aware of, or do not understand and embrace entrepreneurial orientation and organisational ambidexterity.

Technological turbulence ushers in a change in customer expectations (Frank et al., 2019), caused by demands of high quality experience and solutions, where multiple touch points lead to an explosion of data that could be or become a competitive advantage in developing new products and services. The adoption of new emerging technologies can change the way products are produced. It also affects the nature of products and shortens the products' life cycles (Christensen et al., 2018; Ferreras-Méndez et al., 2022; Jafari-Sadeghi et al., 2021). For instance, as customer expectations change, these customers may no longer want to own a product; rather, they may want to consume the value inherently offered by the same product without assuming its ownership (Frank et al., 2019). This changes product firms into being forced to adopt servitisation, where product-centred businesses change to product-service firms (Frank et al., 2019).

In conclusion, both entrepreneurial orientation and organisational ambidexterity are recognised as antecedents of a firm's performance (Jansen, van den Bosch et al., 2006; Lomberg et al., 2017). Therefore, it will be necessary to garner a better understanding of the relationship between entrepreneurial orientation and organisational ambidexterity, and the relative strength of such relationship. This needs to be moderated by technological turbulence, which is critical for the survival of SMMEs operating in turbulent environments (Covin & Wales, 2019; Huang et al., 2021; Lee & Kreiser, 2018).

1.4. Academic Problem

Various scholars had studied the entrepreneurial orientation (Lumpkin & Dess, 1996), and focused on concepts such as antecedents, outcomes and moderators (Engelen et al., 2014; Lisboa et al., 2016; Rose & Mamabolo, 2019; Wales et al., 2021). While research studies provided empirical evidence that supports the view that entrepreneurial orientation leads to a firm's improved performance, a number of scholars have reported contradictory findings in their research studies (Basco et al., 2020; Putniņš & Sauka, 2019; Wales et al., 2021).

Similarly, organisational ambidexterity and its dimensions (March, 1991) have been researched by various scholars over time, and the antecedents, outcomes and moderators have been extensively studied (Luger et al., 2018; Raisch & Birkinshaw, 2008; Shi et al., 2020). Therefore, the extant literature provides empirical evidence that organisational ambidexterity can lead to a firm's improved performance and competitive advantage (Jansen, Van Den Bosch et al., 2006; Junni et al., 2013a; Kang & Kim, 2020; Shi et al., 2020). The extant literature increased on organisational ambidexterity, addressing the tension between exploitation and exploration, and recent studies address this tension on the product-market domain (Andriopoulos & Lewis, 2009; Luger et al., 2018; Randhawa et al., 2021; Zimmermann et al., 2018).

The extant literature posits different views on the correlation between entrepreneurial orientation and organisational ambidexterity. For instance, Wiklund and Shepherd (2011) suggested that, because of its experimental attributes, entrepreneurial orientation is strongly aligned to the exploratory dimension of organisational ambidexterity as opposed to the exploitation of existing opportunities (Bodlaj & Barbara, 2019; Covin & Wales, 2019). Drawing insights from "the resource-based view and dynamic capabilities", Lisboa et al. (2016, p. 1319) state that entrepreneurial orientation facilitates the exploitation and the exploration of products.

On the other hand, Rosenbusch et al. (2013) hold a contradicting view and state that entrepreneurial orientation is associated with exploitation and the exploratory dimensions of organisational ambidexterity. To this end, Covin and Wales (2019) propose that future research

studies should focus on identifying a managerial orientation, which counterbalances or complements the entrepreneurial orientation. It does so to promote the long-term survival of firms, especially the relationship between entrepreneurial orientation and organisational ambidexterity.

The mixed findings on the relationship between entrepreneurial orientation and organisational ambidexterity could possibly be attributed to moderating variables that were not accounted for in these studies (Huang et al., 2021; Lee & Kreiser, 2018). Therefore, the present study focuses on technological turbulence that could influence the relationship between entrepreneurial orientation and organisational ambidexterity. SMMEs operate in rapidly changing and technologically turbulent environments, which shorten product life cycles and compel these firms to seek new opportunities. They can attempt this by developing new products and services that target existing as well as potential or emerging customers (Bodlaj & Barbara, 2019; Ferreras-Méndez et al., 2022; Huang et al., 2021; Wiklund & Shepherd, 2005). Various authors (O'Reilly & Tushman, 2013; Raisch & Birkinshaw, 2008; Shi et al., 2020) also researched the moderating role of institutional factors regarding the relationship between organisational ambidexterity and a firm's performance. Similarly, the extant literature examined the moderating role of institutional factors on entrepreneurial orientation and a firm's performance (Kraus et al., 2012; Wong, 2014). However, no research seems to have been conducted on the moderating role of technological turbulence as far as the correlation between entrepreneurial orientation and organisational ambidexterity is concerned, and especially regarding the impact of turbulence on the product domain (Huang et al., 2021; Lee & Kreiser, 2018).

In summary, the research study first sought to clarify the relationship between entrepreneurial orientation and organisational ambidexterity (Covin & Wales, 2019; Rosenbusch et al., 2013; Wiklund & Shepherd, 2011). Second, it sought to fill the identified gap in the extant literature by examining the moderating role of technological turbulence on the relationship between entrepreneurial orientation and organisational ambidexterity (Huang et al., 2021; Y. Lee & Kreiser, 2018).

1.5. Significance of the Research

1.5.1. Business significance

The significance of the study is based on the fact that SMMEs are consistently confronted by technological turbulence, which compels them to develop new products or services for current and emerging customers, while they are often prone to failure attributed to exogenous factors (Bodlaj & Čater, 2019; Ferreras-Méndez et al., 2022; Klonek et al., 2021). It is therefore imperative to identify the role of technological turbulence on entrepreneurial orientation and organisational

ambidexterity (Hina et al., 2021; Jansen et al., 2006) as the survival and growth of SMMEs will ultimately contribute to the growth of South Africa's economy.

Entrepreneurial orientation and organisational ambidexterity positively result in firms' improved performance in the short and long term, as shown by various research studies. The present research study addresses a real-world problem regarding the survival and growth of SMMEs during turbulent times. It will positively contribute to business by explaining how entrepreneurial orientation and organisational ambidexterity can facilitate a coordinated response in the face of a rapid and exponential change in technology (Christensen et al., 2018; Ferreras-Méndez et al., 2022; Klonek et al., 2021). This will enable SMMEs to make better strategic choices in the face of technological turbulence.

Organisations that are confronted with technological turbulence often have to undergo and endure a high level of change in their processes and products (Hina et al., 2021). How SMMEs engage with organisational ambidexterity is central to entrepreneurship. Entrepreneurs are supposed to be innovative, as an action and process of searching for fresh ideas and pursuing new opportunities that allow them to discover and develop a competitive advantage (Covin & Wales, 2019; Klonek et al., 2021). Therefore, the research study will equip SMMEs with findings that they can use to develop an entrepreneurial and ambidextrous strategy in response to technological turbulence (Christensen et al., 2018; Ferreras-Méndez et al., 2022; Klonek et al., 2021).

1.5.2. Academic significance

The academic significance of the study is inferred on the basis that entrepreneurial orientation continues to gain significant attention in top-tier journals beyond the entrepreneurship scholarly outlets, which listed entrepreneurial orientation as a content-focused keyword when submitting 'entrepreneurship manuscripts' for review (Covin & Wales, 2019; Putniņš & Sauka, 2019; Wales, 2016). Commensurate with the momentum gained in entrepreneurial orientation studies, there is an ongoing conversation and debate on how this concept relates to other constructs within the corporate entrepreneurship domain, especially with organisational ambidexterity (Bodlaj & Barbara, 2019; Covin & Wales, 2019; Rosenbusch et al., 2013).

Given that organisational ambidexterity promotes the short- and long-term success of an organisation (Birkinshaw & Gibson, 2004; Raisch & Birkinshaw, 2008), examining the correlation between entrepreneurial orientation and organisational ambidexterity will be of great value on two levels. First, this will clarify the strength of the relationship between entrepreneurial orientation and organisational ambidexterity (Covin & Wales, 2019). Second, it will determine whether

organisational ambidexterity is a strategic orientation that complements or counterbalances entrepreneurial orientation (Covin & Wales, 2019).

The extant literature has not addressed yet how technological turbulence moderates the relationship between entrepreneurial orientation and organisational ambidexterity (Huang et al., 2021; Lee & Kreiser, 2018). Therefore, the present research study will be significant, as it will seek to bridge the gap in the extant literature by explaining the moderating role of technological turbulence on the relationship between entrepreneurial orientation and organisational ambidexterity.

1.6. Research Objectives

The study's objective is to determine whether entrepreneurial orientation is a predictor of organisational ambidexterity, and to what extent technological turbulence affects the correlation between organisational ambidexterity and entrepreneurial orientation. A statistical analysis was used to examine; first, the individual relationships between entrepreneurial orientation and organisational ambidexterity. Second, the analysis was used to assess the moderating effects of technological turbulence on the relationship between entrepreneurial orientation and organisational ambidexterity.

1.7. The Scope of the Research

The research study was restricted to SMMEs established in South Africa, but it did not specify any industry or sector the SMMEs had to operate in. Studies have shown that entrepreneurial orientation and organisational ambidexterity can be studied at an organisational level (Covin & Wales, 2019; Junni et al., 2013a). The data collection was limited to shareholders, owner managers, and middle managers of these SMMEs as organisational informants (Covin & Wales, 2019).

1.8. The Structure of the Research

In Chapter 2, the literature review is discussed along with the definitions, and the conceptualisation each construct.

Chapter 3 presents the research objectives. It also discusses the conceptual model of the study, the hypotheses to examine the relationships between the constructs.

Chapter 4 presents the research methodology chosen for this study, the research design selected for the data collection and the analyses.

The population and sample are described in Chapter 5, together with the validity and reliability of the dataset and the statistical findings for each hypothesis.

The research findings are analysed and discussed, for each hypothesis in Chapter 6.

The research's academic and business implications, as well as its limitations and suggestions for further research, are presented in Chapter 7.

1.9. Conclusion

Chapter 1 presented the background of the research study, a discussion of the research problem and the significance of the study. The scope and purpose of the research were discussed, and the structural outline of the next chapters was presented. The next chapter presents the literature review with definitions, dimensions of each construct and the relationships between the constructs.

CHAPTER 2 – LITERATURE REVIEW

2.1. Introduction

Chapter 2 presents the literature review. Its purpose is to deepen the conceptual understanding of the moderating role of technological turbulence on the entrepreneurial orientation and organisational ambidexterity relationship. The below sections review literature about entrepreneurial orientation, organisational ambidexterity, and technological turbulence. The chapter begins by examining the conceptualisation of entrepreneurial orientation and its manifestation. It then defines organisational ambidexterity and reviews its theoretical underpinnings. A discussion on technological turbulence then ensues, with a review of its relationship with entrepreneurial orientation and organisational ambidexterity. Finally, Technological turbulence is introduced as a moderator on the relationship between entrepreneurial orientation and organisational ambidexterity are discussed.

2.2. Entrepreneurial Orientation

Entrepreneurship is recognised in extant literature as being crucial in driving economic growth and development. Its potential in alleviating unemployment and inequality has also attracted the attention of practitioners (Bosma et al., 2018; Dele-Ijagbulu et al., 2020). At the same time, the failure rate of SMMEs in South Africa is alarming, which implies that a conducive business environment that would support these small firms therefore is essential to reach their full potential (Dele-Ijagbulu et al., 2020). However, in recent years, South Africa's business climate has been characterised by scarce resources and a slow economic growth (Dele-Ijagbulu et al., 2020). Given South Africa’s current economic status, SMMEs play a critical role in the country achieving the ambitious economic growth strategy that is needed (Bosma et al., 2018; Dele-Ijagbulu et al., 2020). Therefore, as intended in this study, the development of entrepreneurial thinking through comprehending the mechanics of entrepreneurial orientation is crucial (Dele-Ijagbulu et al., 2020; Rose & Mamabolo, 2019).

2.2.1. The conceptualisation of entrepreneurial orientation

Entrepreneurial orientation is a useful framework for deeply comprehending the idiosyncrasy of SMMEs in their entrepreneurship endeavours (Dele-Ijagbulu et al., 2020). The extant literature is divided on the conceptualisation and the number of dimensions entrepreneurial orientation has; however, this fosters scholarly debate, while simultaneously creating fragmentation in the body of knowledge (Covin & Lumpkin, 2011; Wales, 2016; Wales et al., 2020). As such, this necessitated a theoretical review of the conceptualisation of entrepreneurial orientation. The two leading theoretical underpinnings that emerged from this scholarly debate is the unidimensional

conceptualisation of entrepreneurial orientation evidenced by a weighted composite of "risk-taking, innovative, and proactive behaviours" (Covin & Lumpkin, 2011, p. 863; Dele-Ijagbulu et al., 2020; Wales et al., 2020b). The second theoretical underpinning is Lumpkin and Dess' (1996) multidimensional perspective, which incorporated competitive aggressiveness and autonomy to the three aforementioned dimensions originally proposed by Miller (1983) and subsequently echoed by Covin and Slevin (1989).

The unidimensional concept of entrepreneurial orientation

The unidimensional construct means that entrepreneurial orientation exists only "to the extent that risk-taking, innovativeness, and proactiveness" are synchronously demonstrated by a firm (Covin & Wales, 2019, p. 4; Wales et al., 2020). Therefore, the exhibition of one or two dimensions is insufficient for a firm to be classified as entrepreneurial because, statistically, entrepreneurial orientation is the common variance amid the behavioural manifestation of risk-taking, innovativeness, and proactiveness (Covin & Lumpkin, 2011; Covin & Wales, 2019). This means that if one of the three dimensions does not exist, a firm cannot be classified as entrepreneurial, because all three dimensions must co-vary for an organisation to meet that characteristic (Covin & Wales, 2019; Wales et al., 2020).

Mintzberg (1973) was one of the first academics to recognise the value of entrepreneurship as an organisational strategy-making mode. Miller (1983), a student of Mintzberg (1973), deconstructed the concept of entrepreneurship by postulating that an entrepreneurial firm innovates its product-markets, embarks on risky ventures, and develops proactive ideas before its rivals do so (Covin & Wales, 2019; Wales et al., 2020). As a result, entrepreneurial firms are understood to pursue new market entries by taking on riskier competitive strategies such as changing their product lines or technology ahead of their rivals (Lisboa et al., 2016; Wales et al., 2020b). Consequently, the latent construct entrepreneurial orientation was understood by Miller (1983) to be evidenced by a weighted composite of "risk-taking, innovativeness, and proactiveness", which must co-vary (Covin & Lumpkin, 2011, p. 862; Dele-Ijagbulu et al., 2020; Wales et al., 2020).

Therefore, the unidimensional construct explored entrepreneurship as a firm-level attribute by accentuating the organisation's "strategic content as manifest through new entry initiatives" (Wales et al., 2020, p. 648). Since externally focused new entry activities are a defining feature of entrepreneurial firms, the unidimensional concept accentuates the significance of the organisation's market behaviour (Covin & Wales, 2019; Wales et al., 2020).

The multidimensional concept of entrepreneurial orientation

The multidimensional concept advances one's understanding of entrepreneurial orientation as an organisational phenomenon (Wales et al., 2020, 2021). In conceptualising entrepreneurial orientation, "Lumpkin and Dess conceived of competitive aggressiveness" as the firm's predisposition to engage in direct and aggressive competition with rivals in the market (Wales et al., 2020a, p. 649). Autonomy refers to the organisational framework required to enable people to take initiative to realise the firm's vision and idea (Lumpkin & Dess, 1996; Wales et al., 2020). Therefore, Lumpkin and Dess (1996) relaxed the common variance assumption and introduced two additional dimensions: competitive aggressiveness and autonomy (Wales et al., 2020). They conceived entrepreneurial orientation as a multidimensional construct that exists as a set of individual dimensions (Covin & Lumpkin, 2011, p. 863; Wales et al., 2020).

However, for empirical convenience, Wales et al. (2020) observe that measures, which capture all the five dimensions of entrepreneurial orientation as a multidimensional concept, were not widely implemented in research studies. These studies examined the multidimensional concept of entrepreneurial orientation by focusing on proactiveness, risk-taking, and innovativeness by employing the scale as developed by Covin and Slevin (1989). Although empirically convenient, this view has constrained the knowledge of how entrepreneurial orientation manifests at the organisational level and has added to the ambiguity around the conceptualisation of entrepreneurial orientation (Wales et al., 2020). This is predicated on the fact that the multidimensional and unidimensional concept each measure distinct aspects of entrepreneurial orientation (Covin & Lumpkin, 2011; Wales et al., 2020).

Lumpkin and Dess (1996) expostulated the unidimensional concept of entrepreneurial orientation as being too narrow to explain other aspects of entrepreneurial behaviour. This was predicated on the premise that in some situations, entrepreneurial firms may exercise caution and risk-averse behaviour, while in other circumstances, some firms may be benefit more by modelling a highly innovative approach (Lisboa et al., 2016; Lumpkin & Dess, 1996; Putniņš & Sauka, 2019). Consistent with this perspective, there is consensus that the manifestation of entrepreneurial orientation varies significantly from one firm to the other (Covin & Wales, 2019).

While Miller (1983), Covin and Slevin (1989) included strategy as a component of entrepreneurial orientation, Lumpkin and Dess (1996) explicated the tenet of entrepreneurial orientation as multidimensional at a meso-level, in terms of a "broader range of organisational elements and configuration" (Wales et al., 2020a, p. 648). Therefore, the multidimensional concept posits that

entrepreneurial firms adapt their strategic approach to contextual demands, while “pursuing new entry initiatives” (Wales et al., 2020a, p. 648). The next section seeks to reconcile the two conceptualisations of entrepreneurial orientation.

Conceptual reconciliation of unidimensional and multidimensional perspectives

The presumptions that academics have regarding the distinction between the unidimensional and multidimensional concepts are perhaps the reason for conceptual stagnation within studies of entrepreneurial orientation (Wales et al., 2020). Covin and Lumpkin (2011) and Wales et al. (2020) stated that scholars commonly compare the conceptualisation of entrepreneurial orientation to find the most theoretically defensible method. For instance, the number of dimensions of entrepreneurial orientation has been the subject of an excessive amount of research among academics (Covin & Lumpkin, 2011). However, the dimensions of entrepreneurial orientation are inherently “theoretical rather than empirical” (Covin & Lumpkin, 2011, p. 866).

As a result, it is incorrect to propose that entrepreneurial orientation should be defined as a unidimensional or multidimensional concept, based on empirical findings (Covin & Lumpkin, 2011). However, only the degree of the correlation between the dimensions of entrepreneurial orientation's measures may be determined by empirical data (Covin & Lumpkin, 2011). This implies that if entrepreneurial orientation is defined as a multidimensional construct, factor analysis cannot be used as a basis for theoretically establishing an alternative number of dimensions for a set of independent firm-level behavioural characteristics composed of the five dimensions (Covin & Lumpkin, 2011; Wales et al., 2020b). Similarly, if entrepreneurial orientation is defined as a unidimensional construct, then it should be considered as the weighted composite of risk-taking, proactivity, and innovativeness, which must co-vary (Covin & Lumpkin, 2011; Covin & Wales, 2019; Dele-Ijagbulu et al., 2020).

Thus, one has to regard the two unique constructs of unidimensional and multidimensional conceptualisation of entrepreneurial orientation as necessitating independent definitions (Covin & Lumpkin, 2011, p. 863). Accordant with Covin and Lumpkin (2011), Wales et al. (2020) argue that the two conceptualisations are not contradictory to each other; however, they delineate two distinct aspects of entrepreneurial orientation. Covin and Wales (2019) argued that MillerCovin and Slevin’s view explicates the common attributes among entrepreneurial firms, while Lumpkin and Des focus on differentiating entrepreneurial firms Furthermore, both conceptualisations are theoretically meaningful in explicating what it really means to be entrepreneurial (Covin & Wales, 2019; Wales et al., 2020). Therefore, if scholars were to have a clearer understanding of the

fundamentals of these two conceptualisations, Wales et al. (2020), Covin and Lumpkin (2011) accentuated that debates about the conceptualisation of entrepreneurial orientation should never have existed in the first place.

These two major directions of entrepreneurial orientation are not mutually exclusive; rather, they are complementary, but they focus on different phenomena (Covin & Wales, 2019; Wales et al., 2020). Thus, both theoretical underpinnings are plausible and relevant for research studies, while scholars must be explicit about the method they employed regarding the conceptualisation of entrepreneurial orientation (Covin & Wales, 2019; Wales et al., 2020). This study employed the unidimensional concept of entrepreneurial orientation (Covin & Wales, 2019). However, modelling entrepreneurial orientation as a unidimensional construct, as is done with a higher order construct that is reflectively measured (Covin & Wales, 2019), scholars often assume that correlations between independent and dependent variables at the higher order construct correspond to relationships at the dimensional level (Anderson et al., 2019). Anderson et al. (2019) observe that the outcome is often confusing, because the scholars' presumption does not always match with what they modelled. Therefore, while this research adopted a unidimensional perspective, the constructs were also examined at a lower order dimension level as well as at the higher order construct level (Anderson et al., 2019).

2.2.2. Theoretical development of entrepreneurial orientation

The tenets of entrepreneurial orientation as an organisational idiosyncrasy emerged from scholarly discussions, when it became apparent that firms could exhibit entrepreneurial tendencies in the same way as individuals did (Putniņš & Sauka, 2019). There is a substantial and rapidly growing body of research emerging on entrepreneurial orientation (Putniņš & Sauka, 2019; Wales et al., 2021). Yet, one of the most crucial areas of focus for entrepreneurship studies is still entrepreneurial orientation (Covin et al., 2020; Wales et al., 2020c; Wiklund & Shepherd, 2011). The Table below presents an overview of the key theoretical landmarks in the development of entrepreneurial orientation. When thoughtfully studied, these provide key defining pieces of what entrepreneurial orientation really means for firms.

Table 1 Theoretical Landmarks

Authors	Theoretical Landmarks
Schumpeter (1934)	In the economic development theory, it was asserted that the inertial tendency towards routines in established firms created opportunities for entrepreneurial firms to introduce innovations, which lead to a process of creative destruction.
Mintzberg (1973)	Entrepreneurship was conceptualised as a strategy-making mode, which enables firms to adapt and recognise opportunities in complex environments, and then to make bold moves in the face of uncertainty.
Miller (1983)	The unidimensional concept of entrepreneurial orientation was introduced with three dimensions, evidenced by a weighted composite of proactiveness, risk-taking, and innovativeness, which must co-vary. The author contended that "an entrepreneurial firm is one that engages in product-market innovation, undertakes somewhat risky venture and is first to come up with proactive innovations, beating competitors to the punch" (p. 771). At this point, the concept of entrepreneurial orientation attracted academic interest.
Covin and Slevin (1989)	The unidimensional concept of entrepreneurial orientation was accentuated as a strategic mode, which enhances the performance of small firms in hostile and benign environments. This seminal work was the inception of empirical research on entrepreneurship at a meso-level.
Covin and Slevin (1991)	At this point, the theoretical underpinnings of entrepreneurship as an organisational behavioural occurrence were accentuated. The proposed framework delineated the "antecedents and consequences of an entrepreneurial posture as well as variables that moderate the relationship between entrepreneurial posture and firm performance" (p. 7).
Lumpkin and Dess (1996)	The notion of entrepreneurial orientation was extended to a multidimensional construct consisting of proactiveness, risk-taking, innovativeness, autonomy, and competitiveness, which represents dimensions that act as independent predictors that need not co-vary. This conceptualisation led to theoretical disagreements and division among entrepreneurship scholars.
Covin and Lumpkin (2011)	Clarification was provided on entrepreneurial orientation as a firm-level behavioural model rather than as a disposition. A behavioural model was posited on the basis that it gives meaning to the entrepreneurial process. Positioning it as a disposition presented drawbacks in the tenets of entrepreneurial orientation,

	because it would present challenges in differentiating entrepreneurial orientation from other firm-level attributes, such as entrepreneurial culture, and eventually lose its true meaning.
Wales et al. (2020)	The theoretical underpinnings of multidimensional and unidimensional concepts of entrepreneurial orientation were reconciled. It was posited that the two concepts are distinct and not contradictory. They examine different phenomena. As such, the two concepts are complementary.

Source: Adapted from Wales et al. (2021)

2.2.3. The unidimensional manifestation of entrepreneurial orientation

Covin (1991) posited that entrepreneurial orientation is reflected in a company's pattern of outwardly focused behaviour and new market entry initiatives. As such, when pursuing new product-market opportunities, firms are classified as more entrepreneurially oriented than when they "conservatively defend their existing product-market domains" (Wales et al., 2020, p. 647). Therefore, in explicating the manifestation of entrepreneurial orientation as a new entry, Anderson et al. (2019) argue that the most crucial actions separating entrepreneurial from conservative organisations are those that occur at the product-market level in the entrepreneurial endeavours a firm may engage in. The below three presumptions underpin this viewpoint.

First, product innovativeness is an essential attribute, but not a sufficient condition for an organisation to be entrepreneurial (Anderson et al., 2019; Covin & Slevin, 1991; Lisboa et al., 2016). To be entrepreneurial, a firm must be proactive in employing their innovations to create new markets or establish technological leadership (Anderson et al., 2019). This view is predicated on Miller's (1983) assertion that scholars would not classify a firm as entrepreneurial, if it transitioned to a new technology and changed its product line, "imitating competitors, while it refuses to take any risks" (p. 780).

Second, risk-taking firms that have a high financial leverage also are not classified as entrepreneurial (Putniņš & Sauka, 2019), as they also must be engaged in product-market or technological innovations (Lisboa et al., 2016; Miller, 1983). Finally, product innovativeness and proactiveness are easier to observe and to measure (Anderson et al., 2019; Covin & Slevin, 1991). Product-market-level entrepreneurial actions are more likely to be consistent and more likely to change in response to exogenous factors (Anderson et al., 2019; Covin & Lumpkin, 2011).

2.3. Organisational Ambidexterity

It is undesirable for any economy to have low levels of entrepreneurial activities by SMMEs, considering their high rates of failure (Bosma et al., 2018; Dele-Ijagbulu et al., 2020). This situation reflects South Africa's current entrepreneurial landscape (Dele-Ijagbulu et al., 2020). Therefore, organisational ambidexterity has attracted the attention of management scholars and practitioners (Koryak et al., 2018). Despite the attention paid to this concept, it is widely accepted that building an ambidextrous organisation is difficult (Birkinshaw & Gibson, 2004; Zimmermann et al., 2018); hence, the need for research about the nature of its mechanisms to enable SMMEs to capture its wider benefits (Kang & Kim, 2020; Luger et al., 2018; Turner et al., 2013; Voss & Voss, 2013). In the following sections, we endeavour to explicate this range of perspectives.

2.3.1. The conceptualisation of organisational ambidexterity

Scholars posited various conceptualisations of organisational ambidexterity. However, for purposes of this study, this study conceptualises organisational ambidexterity as "the ability of an organisation to simultaneously pursue both explorative (discontinuous) and exploitative (incremental) innovation" (Junni et al., 2013, p. 299). The theoretical underpinnings of organisational ambidexterity find their roots in organisational theory (March, 1991).The phrase ambidextrous organisation was coined by Duncan (1976), when he described the two structures organisations use to handle tasks that required various managerial skills and time horizons. March (1991) then asserted that organisations must engage in opposing activities such as exploration and exploitation, to survive. Building on this landmark, Tushman and O'Reilly III (1996) took this conversation a step further by explicating how firms could handle both evolutionary and revolutionary transformation, through a structural separation between two distinct activities. This viewpoint was generally accepted in the corporate world and added to the discussion of how organisations might respond to disruptive technologies (Christensen et al., 2018; Tushman & O'Reilly III, 1996).

Scholars have conceptualised organisational ambidexterity as a firm-level capability that allows organisations to deal with competing activities such as exploration and exploitation (Jansen, van den Bosch et al., 2006; Luger et al., 2018). The key distinctions in how organisational ambidexterity is conceptualised are whether it relates to striking an ideal balance between exploration and exploitation, or whether it entails combining high levels of both exploitation and exploration (Junni et al., 2013; Luger et al., 2018). Considering this distinction, academics contend that organisational ambidexterity is best represented as the middle or optimal position on a continuum, with exploration at one end and exploitation at the other (Gupta et al., 2006; Junni et

al., 2013c). Luger et al. (2018) took exception to this view and reconceptualised organisational ambidexterity as "the ability to dynamically balance exploration and exploitation" (Luger et al., 2018, p. 450). This results from combining competence-enhancing processes to achieve the explore-exploit balance, with competence-shifting processes applied to adapt the explore-exploit balance. An overview of seminal research conceptualising organisational ambidexterity is set out below

Table 2 Archetypes and definitions

Authors	Archetypes	Definitions	Theoretical Underpinnings
Gibson and Birkinshaw (2004)	Contextual Ambidexterity	"The behavioural capacity to simultaneously demonstrate alignment and adaptability across an entire business unit" (p. 209)	Organisational culture
Gupta et al. (2006)	Punctuated Ambidexterity	"Cycling between long periods of exploitation and short periods of exploration" (p. 698)	Punctuated equilibrium
Tushman and O'Reilly III (1996)	Structural Ambidexterity	"The ability to simultaneously pursue both incremental and discontinuous innovation that result from hosting multiple contradictory structures, processes, and cultures, within the same firm" (p. 24)	Organisational design and social network theory

Source: Adapted from Kassotaki (2022)

2.3.2. Theoretical development of organisational ambidexterity

One of the more recurrent themes in organisational study is the capacity of an organisation to utilise its current capabilities, while concurrently exploring fundamentally new competencies (König et al., 2021; Luger et al., 2018). Building upon the work of Duncan (1976), March (1991) sparked the debate through his proposition that firms should conduct opposing activities such as exploration and exploitation. Tushman and O'Reilly III (1996) then proposed that firms could

implement structural separations to manage the evolutionary transformation of an organisation. March's (1991) thesis implied that when firms simultaneously engage in exploratory and exploitative innovations, they have a higher chance of success than those that take only one of these avenues. This argument was backed by Gupta et al. (2006), who explicated the interplay between exploration and exploitation, and argued that organisations that predominantly pursue exploitation produce results that are predictable but not necessarily sustainable.

This view was predicated on the premise that exploration and exploitation are intrinsically self-reinforcing (Gupta et al., 2006). Their contention was that firms that accentuate exploitation might perform well in the short term, but that would put them in a competence trap, since they might not be able to adapt to changes in the environment (Gupta et al., 2006; Jansen, van den Bosch et al., 2006). Conversely, firms that over-emphasise exploration may fall into a failure trap (Gupta et al., 2006). Jansen et al. (2006) extended this discourse by providing empirical evidence on how the organisational ambidexterity yields a firm's improved performance. However, scholars advocated that it is very difficult to build an ambidextrous capability (Lavie et al., 2010; Raisch et al., 2009).

In this vein, Raisch et al. (2009) explicated how firms could balance exploitation and exploration for sustained performance. In a meta-analysis, O'Reilly and Tushman (2013) provide clarity on how the different modes of organisational ambidexterity could help achieve balance between exploration and exploitation, and these include sequential, structural, and contextual ambidexterity. Consequently, it became widely accepted that organisational ambidexterity is the primary driver of a firm's performance, which can be attributed to a simultaneous pursuit of exploration and exploitation that increases short- and long-term success (Jansen, van den Bosch et al., 2006; Junni et al., 2013; Zimmermann et al., 2018).

Since then, organisational ambidexterity has been gaining traction in the field of organisational theory (Kang & Kim, 2020; Luger et al., 2018; Raisch et al., 2009). As a result, the tenet of organisational ambidexterity has become more developed and expanded, based on the increased focus. First, organisational ambidexterity has been demonstrated to have a positive correlation with a firm's performance in numerous large-scale empirical research and meta-analyses, which have helped to solidify the theory behind this relationship (Gibson & Birkinshaw, 2004; Jansen, van den Bosch et al., 2006; Junni et al., 2013; Raisch et al., 2009). Second, extensive research into the role of contextual (Gibson & Birkinshaw, 2004) and leadership (Smith & Tushman, 2005) antecedents have been the focus of the initial emphasis on structural antecedents (Raisch et al., 2009; Simsek et al., 2009). Third, Jansen et al. (2006) examined how environmental moderators

affect the interrelations between organisational ambidexterity, its antecedents and a firm's performance.

Despite the maturity of the concept of organisational ambidexterity, little is known about how exploratory and exploitative activities evolve over time (Kang et al., 2021; Luger et al., 2018). While the tenet of ambidexterity may be static, the larger explore-exploit discourse has been advanced by more dynamic contributions, such as formal models and discontinuous jumps between exploration and exploitation (Luger et al., 2018). Additionally, since most environments change over time, Luger et al. (2018) argue that maintaining any given exploit-explore balance would cause misalignment with the environment and negatively affect a firm's performance. This proposition created a platform for questions such as "Do firms move away from ambidexterity, if external contexts demand stronger alignment with either exploration or exploitation?" (Luger et al., 2018, p. 450). This phenomenon is more explicit in the discourse below, regarding the moderating role of technological turbulence on entrepreneurial orientation and organisational ambidexterity.

2.3.3. Exploration and Exploitation

As the environmental context changes, organisations should quest for opportunities to constantly reinvent themselves by engaging in exploitation and exploration of new ones (Bodlaj & Čater, 2019; Jansen, van den Bosch et al., 2006). The notion of exploration and exploitation is an underlying and recurring concept in innovation and entrepreneurship (Hughes et al., 2021; Jansen, van den Bosch et al., 2006; Shane & Venkataraman, 2000). March (1991) stated that exploitation and exploration are two fundamentally distinct learning processes, and organisations have to ensure that they split not only their attention, but also their resources between these two processes (Raisch & Birkinshaw, 2008).

Exploration is associated with activities such as "search, variation, experimentation, and discovery" (Raisch & Birkinshaw, 2008, p. 376). Therefore, explorative innovations are radical in nature; they break away from the norm of business activities and seek to satisfy emerging customer needs (Hughes et al., 2021; Jansen, van den Bosch et al., 2006; Lisboa et al., 2011). Gupta et al. (2006) explicated the notion of exploration as knowledge attained through coordinated experimentation and variation processes. Consequently, exploration is a discovery-driven innovation that necessitates either novel information or a departure from conventional knowledge (Hughes et al., 2021; Levinthal & March, 1993; Lisboa et al., 2011). As a result, exploratory innovations offer

“new designs, create new markets, and develop new distribution channels” (Jansen et al., 2006, p. 1662).

Conversely, the notion of exploitation was defined by Gupta et al. (2006) as “learning obtained via local search, experiential refinement, and the choice and reuse of existing procedures” (p. 694). Exploitative innovations are incremental in nature, created to satisfy current customer needs (Gupta et al., 2006; Jansen, van den Bosch et al., 2006; Luger et al., 2018). Consequently, they improve current products, boost the effectiveness of current distribution methods, and widen existing knowledge and capabilities (Jansen, van den Bosch et al., 2006).

Both exploration and exploitation depend on learning, improving, and acquiring new knowledge, as is clear from the extant literature (Gupta et al., 2006; Luger et al., 2018). The distinctions between the two continuums relate to the relevant trajectory, which implies that learning new knowledge follows either the same trajectory as prior knowledge or or alternatively, it follows a completely different trajectory (Gupta et al., 2006; Lisboa et al., 2011; Luger et al., 2018).

However, the extant literature also appears to treat all learning- and innovation-related behaviours as occurrences of exploration and restricts the term ‘exploitation’ for actions when the main objective is leveraging prior information, rather than embarking on any kind of learning trajectory (Gupta et al., 2006; Rosenkopf & Nerkar, 2001). This conceptualisation is made clear in Rosenkopf and Nerkar’s (2001) analysis of the impact of local and non-local knowledge searches on the quality of subsequent patents (Gupta et al., 2006). However, they opted to refer to exploitation as the most localised exploration, even though their study was primarily focused on the research and development processes, and patent activity (Gupta et al., 2006).

For the purposes of this study, the reasoning of March (1991) was employed, which demonstrated that all activities include at least some learning (Gupta et al., 2006; Muhlroth & Grottke, 2022). When an organisation does nothing except repeat what it has done before, it nonetheless should at least learn from its past and move forward on the learning curve, though slow (Gupta et al., 2006; Levinthal & March, 1993; Muhlroth & Grottke, 2022). Therefore, the type of learning should be used to distinguish between exploration and exploitation, rather than its presence or absence, as this makes more sense.(Gupta et al., 2006; Levinthal & March, 1993; Muhlroth & Grottke, 2022).

2.3.4. The trade-offs between explorative and exploitative innovation

Organisational ambidexterity consists of two continuums: Exploration on one end, and exploitation on the other (Birkinshaw & Gupta, 2013; Gupta et al., 2006; Luger et al., 2018). Even though exploitation and exploration are both necessary for a firm's survival, the two continuums are inherently contradictory (Kang & Kim, 2020; March, 1991).

To begin with, "exploration and exploitation compete for scarce organisational resources"; and put differently, exploitation tend to suffer, when more resources are allocated to exploration and vice versa (Gupta et al., 2006, p. 695; Kang & Kim, 2020; Lavie et al., 2010). By allocating resources to exploration or exploitation, organisations face trade-offs between their desired outcomes (Kang & Kim, 2020; Lavie et al., 2010). Consequently, firms can attain certainty of short-term success at the risk of becoming obsolete in the future by devoting resources to the improvement of existing technological capabilities associated with exploitation rather than developing new competences attendant to explorations, and vice versa (Lavie et al., 2010). Accordingly, the conflict between exploration and exploitation is all about short-term success versus long-term success.

Second, both exploration and exploitation are self-reinforcing activities that frequently result in disparate organisational outcomes (Gupta et al., 2006; Lavie et al., 2010; Zimmermann et al., 2018). The experimental nature of exploration often results in failure, which encourages the quest for newer concepts, and this subsequently leads to more exploration and a failure trap (Gupta et al., 2006; Luger et al., 2018; Zimmermann et al., 2018). In contrast, exploitation often results in short-term success, which in turn encourages additional exploitation along the same path, which eventually leads to a success trap (Gupta et al., 2006; Lavie et al., 2010; Zimmermann et al., 2018). Consequently, more exploration drives out exploitation, and conversely, more exploitation drives out exploration.

As a result, organisations compromise between stability and adaptability (Gibson & Birkinshaw, 2004; Lavie et al., 2010; Luger et al., 2018). While adaptability and change are linked to exploration, stability is associated with exploitation (Lavie et al., 2010; Luger et al., 2018). Consequently, organisations that place a greater emphasis on exploitation tend to develop inertia, making it challenging for them to adapt in the face of dynamic contexts.

In summary, exploration and exploitation require profoundly distinct organisational practices and mentalities, making it difficult to pursue both simultaneously (Gupta et al., 2006; Simsek et al., 2009). Despite the benefits of both exploration and exploitation, their interaction takes the shape

of a zero-sum game, in which they fight for the same resources (Gupta et al., 2006). Therefore, exploration and exploitation are two conflicting continuums. Organisational structures, approaches, and environments for exploitation and exploration may need to be substantially different (Lavie et al., 2010; Luger et al., 2018; Raisch & Birkinshaw, 2008). However, finding a balance between exploration and exploitation is crucial for a firm's survival; and therefore, the discussion on how organisational ambidexterity can be achieved ensues in the next section (Huang et al., 2021; Kang & Kim, 2020).

2.3.5. Balancing exploration and exploitation

Many academics have advocated for organisations to sequentially alternate between times of exploitation and exploration (Lavie et. al., 2010; Simsek, 2009). This viewpoint postulates that "dynamic, temporal sequencing of routines for exploitation and exploration will lead to sequential ambidexterity" (Raisch et al., 2009, p. 687). For purposes of this study, organisational ambidexterity has been defined as the simultaneous pursuit of exploration and exploitative innovations. In this vein, multiple organisational approaches have been proposed by scholars to help firms achieve organisational ambidexterity. However, Raisch et al. (2009) and Luger et al. (2018) argue that these studies took a more static approach, in that firms achieve ambidexterity by adopting a particular configuration.

Simsek et al. (2009) postulated that reciprocal ambidexterity is most likely to emerge in complex and turbulent environments, where there is a quest for a depth of knowledge to exploit and explore opportunities. While structural ambidexterity involves pooling interconnectedness between exploitation and exploration-performing units, reciprocal ambidexterity entails the sequential pursuit of exploitation and exploration across units (Lavie et. al., 2010; Simsek et al., 2009). It assumes a reciprocal interdependence; for instance, financial resources generated through exploitative innovation are ploughed in explorative innovation of new product-markets (Lavie et. al., 2010; Simsek et al., 2009). Therefore, when new products gain dominance in the market, the product's performance is subsequently improved through exploitative innovation. Thus, the output of exploration in the form of new product markets is improved through exploitative innovation (Simsek et al., 2009).

Furthermore, unlike punctuated ambidexterity which requires managers to shift responsibilities at a given point in time, reciprocal ambidexterity quests for "collaborative problem solving, joint decision-making, and resource flows" (Simsek, 2009, p. 886) between exploitation and exploration units. Therefore, reciprocal ambidexterity is more synergistic, as it complements

explorative and exploitative innovations that occur over time. Given that SMMEs often have to contend with a scarcity of resources, one can posit that reciprocal ambidexterity is applicable for these firms. However, while SMMEs may employ different modes of balancing exploration and exploitation activities (Lavie et. al., 2010). As defined above, this study supports and emphasises Luger et al.'s (2018) claim that organisational ambidexterity differs conceptually from other theories like punctuated or temporal ambidexterity, which explain how exploration and exploitation occur in the same firm, at different times.

2.4. Technological Turbulence

The rate of technological change is unprecedented, and SMMEs play a pivotal role as change agents in exploring opportunities presented by evolving technologies such as "blockchain, big data, artificial intelligence, virtual/augmented reality, 3D-printing or cloud computing" (Steininger, 2019, p. 364).

2.4.1. Conceptualising technological turbulence

Jaworski and Kohli (1993) introduced the notion of environmental turbulence as a moderator with the following three dimension: (1) market turbulence, (2) competitive intensity and (3) technological turbulence. Technological turbulence creates unstable environments, forcing organisations to constantly reallocate resources as it is presented with new product-market opportunities (Atuahene-Gima & Li, 2004; Bodlaj & Barbara, 2019; Wang et al., 2022). In contrast, Wang et al. (2022) argue that technological turbulence creates discontinuities, which destroys competences (Mckinley, 2022). Given the exponential rate of technological changes, the threat and opportunities they pose for SMMEs, the research study paid special attention to technological turbulence as a moderator (Christensen et al., 2018; Engelen et al., 2014; Ferreras-Méndez et al., 2022).

Technological turbulence creates discontinuities in technology (Mckinley, 2022; Wang et al., 2022). In their seminal work, Tushman and Anderson (1986) introduced the notion of technological discontinuity. They defined it as a change in technology, which offers a "sharp price-performance improvements over existing technologies" (p. 441). They put forth that technological discontinuity can be classified as "competence-destroying or competence-enhancing", because it either destroys the firm's core competences or it enhances it, respectively (Tushman & Anderson, 1986, p. 441).

However, Mckinley (2022) contest this view and argue that "technological discontinuity can be both competence-destroying and competence-enhancing" (p. 729). The dichotomy between

competence-destroying and competence-enhancing technological discontinuities was the focal point of Tushman and Anderson's (1986) theoretical underpinnings, which characterised the phenomenon as an either-or. Mckinley (2022) deconstructs this concept from an ecological perspective, arguing that a technological discontinuity can destroy competencies in certain sectors of an "ecosystem, while simultaneously strengthening competences in others" (p. 729). The competence ecosystem goes beyond the bounds of one firm. Therefore, this study takes Tushman and Anderson's (1986) view, because the unit of analysis is at a single organisational level (Mckinley, 2022).

Whenever a competence-destroying discontinuity occurs in an industry, the capabilities of the incumbent firms become obsolete, forcing the firms to either upgrade their capabilities or risk losing market share (Iqbal et al., 2020; Mckinley, 2022). Accordant with Tushman and Anderson (1986), in technological turbulence, firms lose their market share because of inertial tendencies that prevent them from acquiring the relevant capabilities to effectively compete against competitors (König et al., 2021). In contrast, competence-enhancing technological discontinuity tends to strengthen incumbents' know-how and competitive advantage, which leads to market consolidation (König et al., 2021; Mckinley, 2022).

The advent of streaming channels is an example of competence-destroying technological discontinuity (Mckinley, 2022; Wang et al., 2022). Customers can now subscribe to services such as Amazon Prime, Showmax, and Netflix, and watch their favourite television programmes at any time, from their televisions or mobile devices. Using data at its core, algorithms recommend viewing content to customers, based on viewing habits. This competence-destroying technological change disintermediated Blockbuster, as in-store services were made obsolete (Mckinley, 2022). Tushman and Anderson's (1986) theoretical underpinnings are widely accepted in the extant literature, and their conceptualisation is in accordance with the definition of technological turbulence as shown in Table 3. However, in the context of this study, technological turbulence was defined as "the rate of technological change and unpredictability, which is characterised by the instability and rapid obsolescence of technologies" (Wang et al., 2022, p. 1440).

However, the rise of new technologies does not always imply that they inevitably replace the preceding technology (Adner & Kapoor, 2016; Muhlroth & Grottke, 2022). Therefore, interactions between "existing and emerging technologies are not unitary, but they can range from mutual benefit to mutual damage" (Muhlroth & Grottke, 2022, p. 494). For instance, the development of

a new technology can always also enhance the development of an old one in a symbiotic relationship (Adner & Kapoor, 2016).

Alternatively, in a predator-prey relationship, one of the technologies benefits, while the other one suffers, depending on whether it is a new or existing technology (Cozzolino & Rothaermel, 2018; Muhlroth & Grottke, 2022). Finally, a purely competitive interaction simply creates a situation where an emerging technology cannibalises the preceding one (Adner & Kapoor, 2016; Muhlroth & Grottke, 2022). However, over time, the mode of interaction may change (Cozzolino & Rothaermel, 2018; Muhlroth & Grottke, 2022). For instance, a new technology may spur increased use of the current technology, before eventually switching to a predator-prey relationship and eventually being cannibalised (Muhlroth & Grottke, 2022). Therefore, in the context of this study, technological turbulence refers to the "rate of technological change and unpredictability, which is characterised by the instability and rapid obsolescence of technologies" (Wang et al., 2022). Table 3 summarises the definitions of technological turbulence.

Table 3: Summary of definitions of technological turbulence

Author	Definition of Technological Turbulence
Jaworski and Kohli (1993)	"The rate of technological change" (p. 57)
Wang et al. (2022)	"The rate of technological change and unpredictability, which is characterised by the instability and rapid obsolescence of technologies" (p. 1440)
Hung and Chou (2013)	"The rate of technological change and unpredictability, which rapidly makes a firm's existing technological knowledge obsolete" (p. 371)
Iqbal et al. (2020)	"In technological turbulence, technologies become obsolete and new disruptive technologies substitute their place" (p. 399)
Wu et al. (2017)	"The rate of technological change in the industry" (p. 129)

Source: Author (2022)

2.4.2. Antecedents of adaptation to technological turbulence

Firm size

Agarwal and Audretsch (2001) demonstrated that smaller firms are susceptible to failure in turbulent environments, compared to their larger counterparts (Eggers & Francis Park, 2018). The stylised findings are attributed to the size and age of firms; however, other scholars contested this

view and posited that smaller firms can survive by occupying a strategic niche (Agarwal & Audretsch, 2001; Eggers & Francis Park, 2018). Empirical findings posited that the stylised results were true; however, not for all industries and situations, because “technology and industry life cycles are instrumental in shaping industry dynamics” (Agarwal & Audretsch, 2001, p. 39).

Larger organisations may have a better chance of survival compared to SMMEs due to the financial muscle they possess, this enables them to acquire and commercialise cutting-edge technologies (Eggers & Francis Park, 2018; Simsek et al., 2009). However, larger firms are widely known of falling prey to their inertial tendencies, compared to their smaller counterparts (Eggers & Francis Park, 2018; König et al., 2021; Tripsas & Gavetti, 2000). Therefore, we posit that SMMEs are more agile and flexible in adopting emerging technologies, compared to their counterparts, as a result this enables them to adapt in the face of technological turbulence.

The organisation’s experience

Lourdes Sosa (2013) set forth that all firms that “existed before a technological change” have some form of experience; this may be derived from technological research and development or the firm’s prehistory (Eggers & Francis Park, 2018). However, firms have different types of prehistory, and this has implications when they try to adapt to technological changes (Lourdes Sosa, 2013). First, leveraging on their ability to commercialise new technologies, firms with prehistory have the ability to develop adaptation capabilities (Eggers & Francis Park, 2018). Prior experience with technological adoptions promotes adaptation, and this knowledge can be redeployed in new technological adoptions and taking advantage of new opportunities (Eggers & Francis Park, 2018).

Cannibalisation

The relationship between the new technology and the firm's present operations influences both its capacity and incentive to adapt to new technologies (Eggers & Francis Park, 2018). Firms that make huge strategic commitments to existing technologies fall prey to path dependences, and organisational inertia hinders their adaptation to emerging technologies (Christensen & Bower, 1996; Eggers & Francis Park, 2018). The firms’ willingness to cannibalise their existing technologies and business operations is critical for survival. Christensen and Bower (1996) explicated that firms find it difficult to stop serving their current customer segments in favour of emerging customers’ needs associated with new technologies (Eggers & Francis Park, 2018). This is a function of path dependencies and organisational inertia. For instance, IBM heavily focused their attention on exploiting opportunities associated with mini-computers at the time, and

subsequently, the mini-computer producers missed opportunities on desktop computers, which were explored and exploited by new entrants such as Apple (Christensen & Bower, 1996). One should thus conclude that SMMEs are less apprehensive to cannibalising existing technologies, as they are more likely to leverage on emerging technologies and disintermediate larger firms (Eggers & Francis Park, 2018).

Complementary assets

The theoretical underpinnings of complementary assets are rooted in Teece's (1986) seminal work, wherein he explicated how incumbent firms can profit from technological innovation (Cozzolino & Rothaermel, 2018). Complementary assets are needed for commercialising new technologies. Teece (1986) argued that to commercialise emerging technologies requires know-how and other assets or capabilities, known as complementary assets.

Core competencies

In most industries, technological change is characterised by "long periods of incremental innovation punctuated by periods of radical change" (Tripsas, 1997, p. 121). Therefore, technology changes in a progressive trajectory, until it is superseded and replaced by a new paradigm, which threatens the firms' core competencies (Mckinley, 2022; Tripsas, 1997). In periods of incremental technological change, organisations can become trapped in their core competencies, resulting in core rigidities, which make it difficult to adapt in the face of radical technological changes (Mckinley, 2022; Tripsas, 1997; Tripsas & Gavetti, 2000).

In contrast, Christensen and Bower (1996) demonstrated that disk-drive firms were able to respond to radical technological advances (Tripsas, 1997). If firms possess dynamic capabilities (Teece et al., 1997), referring to the firm's ability to build and reconfigure its core competencies to cope with technological turbulence, they can successfully adapt to incremental and radical technological changes (Teece, 2007, 2018; Tripsas, 1997).

Resources and ecosystem partners

A strategic investment in new technology involves significant financial commitments and critical trade-offs (Kapoor & Lee, 2013). Early adoption of new technology may enable firms to secure a competitive position as first movers (Ferreras-Méndez et al., 2022). In contrast, given the technological and market unpredictability, an early investment in new technology may expose firms to significant financial risk, because of uncertainty in the commercialisation thereof (Kapoor & Lee, 2013).

Kapoor and Lee (2013) argue that a firm's ability to commercialise a new technology partly depends on ecosystem partners, who may need to make new investments and alter their own operations to bring the new technology to market (Eggers & Francis Park, 2018). In addition, SMMEs are in most cases confronted with a lack of resources, which may hinder their ability to adopt new technologies (Ruiz-Jiménez et al., 2021). However, empirical evidence demonstrates that 'coopetition' and an alliance with innovation ecosystem partners can act as a catalyst when aiming to adapt to new technologies (Cozzolino & Rothaermel, 2018; Eggers & Francis Park, 2018; Kapoor & Lee, 2013).

2.5. Entrepreneurial Orientation and Organisational Ambidexterity

The two elements of contention in this study are as follows; first, Covin and Wales (2019) argue that an entrepreneurial orientation is innately exploratory with a focus on searching for new opportunities. Therefore, this argument implies that the demonstration of entrepreneurial orientation does not capture or have much bearing on the efficient and successful exploitation of present opportunities. Second, Lisboa et al. (2011) and Rosenbusch et al. (2013) hold a contradicting view and believe that entrepreneurial orientation is associated with the exploration and exploitation of opportunities.

Entrepreneurial orientation captures the way a firm expects to compete in the market and is thus a form of strategic orientation (Lisboa et al., 2011). "It refers to the decision-making styles, processes, and methods that guide a firm's activities" (Lisboa et al., 2011, p. 1277). Consequently, innovativeness, proactiveness, and risk-taking are widely accepted as key dimensions of entrepreneurial orientation (Covin & Wales, 2019; Lisboa et al., 2011). Entrepreneurial orientation can facilitate the use of exploitative product-market development, despite the misconception that it is only a precursor to discovery-led product-market development linked with exploration. (Lee & Kreiser, 2018; Lisboa et al., 2011; Rosenbusch et al., 2013).

Entrepreneurial orientation can facilitate the use of exploitative product-market development, despite the misconception that it is only a precursor to exploration of product-market development (Covin & Wales, 2019; Lisboa et al., 2011; Rosenbusch et al., 2013). Innovativeness specifically has a propensity to encourage experimentation, inventiveness, and searching for opportunities to produce products for markets (Lumpkin & Dess, 1996; Wales et al., 2021). Such a tendency is likely to lead to product enhancements and the extension of currently available product-markets; these actions represent an exploitational form of innovation in organisational ambidexterity (Huang et al., 2021; Lisboa et al., 2011).

Proactivity pertains to market and environmental responsiveness, demonstrating foresight and acting on explicit or latent customer needs and preferences (Lisboa et al., 2011; Lumpkin & Dess, 1996). Most customers want continual product improvement, and a deeper understanding of their needs. Consequently, improved products are becoming the nexus of competitiveness for many organisations (Ferreras-Méndez et al., 2022; Lisboa et al., 2011).

Accepting the possibility of a negative outcome and a high cost of failing when aiming to pursue a potentially rewarding opportunity is an example of risk-taking (Lisboa et al., 2011; Putniņš & Sauka, 2019). Incremental improvements to current product-markets balance the total risk of business failure, and thus, SMMEs could pursue incremental innovation, given the likelihood of failure in exploratory innovations (Gupta et al., 2006; Lisboa et al., 2011; Putniņš & Sauka, 2019). To this end, entrepreneurial orientation is a predictor of the exploitative dimension of organisational ambidexterity (Lisboa et al., 2011; Rosenbusch et al., 2013).

Because of their attributes of proactiveness and innovativeness, SMMEs can demonstrate their strategic foresight, question conventional wisdom, and hold the view that leading the market is preferable to being customer-led in innovations (Lisboa et al., 2011; Lumpkin & Dess, 1996; Wales et al., 2020a). This would enable them to proactively engage in the exploratory dimension of organisational ambidexterity (Covin & Wales, 2019; Wiklund & Shepherd, 2011).

The risk appetite for entrepreneurial activities with an uncertain outcome enables SMMEs to engage in the exploratory dimension of organisational ambidexterity, despite the fact that it is associated with the risk of failure based upon the uncertainty of the outcome (Lisboa et al., 2011; Putniņš & Sauka, 2019). It follows that the entrepreneurial orientation promotes a firm's activities pertaining to prioritising research and development, developing new or novel products that are not only ahead of the competitors, but also ahead of recognition by the existing customers (Hughes et al., 2021; Lisboa et al., 2011). Therefore, an entrepreneurial orientation encourages the pursuit of innovation, research, and development, creating cutting-edge product solutions that are ahead of the competitors and ahead of what existing customers expect (Hughes et al., 2021; Lisboa et al., 2011). Similarly, entrepreneurial orientation welcomes the unpredictability of breaking into new markets. Thus, a positive relationship exists with the explorative dimension of organisational ambidexterity (Hughes et al., 2021; Lisboa et al., 2011).

In summary, SMMEs are concerned about their short and long-term survival, and entrepreneurial orientation encapsulates how firms compete in the market. Therefore, the implication of this study is that entrepreneurial orientation is a precursor of organisational ambidexterity.

2.6. Entrepreneurial Orientation and Technological Turbulence

Technological turbulence is a dynamic force that is reshaping societies and changing organisational routines, through the constant emergence of new technologies. This has an impact on business conceptions and procedures (Bodlaj & Čater, 2019; Jafari-Sadeghi et al., 2021). The extant literature demonstrated that the inability to adapt in the face of technological change is a major source of obsolescence and extinction for many firms (Christensen et al., 2018; Lee & Csaszar, 2020; Tripsas & Gavetti, 2000). Therefore, firms must contend with technological changes and discontinuities, and instead, use emerging technologies to their advantage to shape and influence their future by seizing the opportunities they bring (Bodlaj & Čater, 2019; Covin et al., 2020).

Scholars in the field of strategic entrepreneurship argue that organisations with an entrepreneurial orientation are better placed to identify and capture these possibilities, allowing them ultimately to effectively navigate turbulent environments (Poudel et al., 2019). Similarly, academics who study technological change stress the importance of speed to market and strong technological capabilities for addressing new product-market opportunities (Poudel et al., 2019).

For instance, Ferreras-Méndez et al. (2022) advocate that technological turbulence shortens product life cycles, and therefore, firms need to proactively respond by speeding up innovations and achieve speed to market, to capture first-mover advantages before competitors can respond to emerging opportunities (Lumpkin & Dess, 1996). When searching for ways to address market gaps, arguably, innovative technologies that are still in their infancy are preferable, because they enable firms to create novel products that set them apart from their competitors, albeit such move is risky (Huang et al., 2021; Poudel et al., 2019).

Wiklund and Shepherd (2011) accentuated that entrepreneurial orientation can have positive and negative implications for organisations. Poudel et al. (2019) reason that the negative consequences of entrepreneurial orientation could emanate from a high risk-taking posture. High risk-taking tendencies could lead organisations to strongly pursue technological innovations that may well have a high likelihood of failure. There is substantial evidence that SMMEs are often vulnerable because of their lack of financial resources. Therefore, failed innovations could result in significant adverse effects for these firms (Dele-Ijagbulu et al., 2020; Poudel et al., 2019).

Technological turbulence changes the entrepreneurial landscape by transforming society and presenting fresh business opportunities (Jafari-Sadeghi et al., 2021). In this context, Wales et al. (2020) argue that entrepreneurially oriented firms explore new entry opportunities, while Wang (2008) accentuated that this attribute is exhibited by taking an aggressive or offensive strategic

mode. On the other hand, less entrepreneurially oriented firms are more prone to defending their existing product-market domains (Wales et al., 2020). Accordant with Wang (2008), this attribute is exhibited by a defensive strategic approach to entrepreneurial challenges.

Wang (2008) posited that entrepreneurial firms may respond to technological turbulence by leveraging on their forward-looking capabilities and proactively adapting to rapid technological changes. Covin et al. (2020) contend that proactiveness is "the ability to anticipate and respond to new value creation opportunities" (p. 3). Therefore, an offensive strategic approach exhibits high levels of proactiveness, risk-taking and innovativeness (Putniņš & Sauka, 2019; Wang, 2008). This enables these firms to develop novel products and create new markets, by taking advantage of fresh opportunities presented by technological turbulence (Bodlaj & Čater, 2019; Covin & Wales, 2019; Wang, 2008). However, as posited by Poudel et al. (2019), high risk-taking could result in potential failure associated with a significant loss of the already constrained financial resources.

Alternatively, firms may decide to assume a defensive approach in technologically turbulent environments (Wales et al., 2020; Wang, 2008). In this strategic posture, firms are low risk-takers (Putniņš & Sauka, 2019), they proactively attempt to create a more stable domain by defending their product-markets. Their intention is to establish a more stable domain and thrive on consistency, dependability, and efficiency (Wales et al., 2020; Wang, 2008). The firms' innovativeness is manifested by opting for incremental innovations, which improve existing technologies and by exceptionally implementing them, instead of adopting new ones (Lee & Csaszar, 2020). However, Lee and Csaszar (2020) expostulate that if this strategy is not well executed, it could lead these firms out of business, because they would lag behind their competitors.

Lumpkin and Dess (1996) defined innovativeness as the firm's openness to new ideas, creativity, engaging in experimental activities and technological leadership. Marcati et al. (2008) contended that innovativeness occurs on two levels; (1) general innovativeness is the degree to which firms are open to accept novel ideas and concepts, and (2) specific innovativeness, which is the predisposition to early adoption of innovations within a specific domain. The necessity and significance of research and development are heightened by technological turbulence. Therefore, highly innovative firms are more open to the adoption of emerging technologies.

Entrepreneurial firms that adopt an offensive approach are also highly proactive in commercialising new technologies, they make significant investments in new idea development, market awareness, and technological advancement, and are leading the way for industry

developments (Putniņš & Sauka, 2019; Spencer et al., 2008; Wang, 2008). Continuous awareness of change is crucial to this process, and these firms are always on the lookout for pertinent technology signals and trends in the external environment (Covin et al., 2020; Muhlroth & Grottke, 2022). Additionally, these firms engage in a significant amount of learning through experimentation, associated with innovativeness and radical innovation (Lumpkin & Dess, 1996; Wang, 2008). Therefore, they associate innovativeness with product-market exploration and aggressively pursuing exploratory innovation (Covin & Wales, 2019; Wiklund & Shepherd, 2011).

2.7. Organisational Ambidexterity and Technological Turbulence

The extant literature on organisational studies has largely focused on the difficulties firms have in responding to discontinuous change and the remarkable ways, in which some of them have managed to adapt and survive (Christensen et al., 2018; Christensen & Bower, 1996; Eggers & Francis Park, 2018). Technological turbulence breeds technological discontinuity and creates opportunities for unique methods of value creation and capture that significantly deviate from the accepted norms of continuous incremental innovation, which is associated with exploitation (Philip. Anderson & Tushman, 1990; Iqbal et al., 2020; König et al., 2021). König et al. (2021) posit that various obstacles to adaptation and countermeasures for inertia have been uncovered through research studies on technological discontinuous change in digital imaging and fibre optics, as an example.

Gilbert (2005) posited that discontinuous change in technology is external change, which necessitates “internal adaptation along a path that is nonlinear, relative to a firm’s traditional innovation trajectory” (p. 742). Gilbert’s (2005) proposition is in accordance with the extant literature that views technological turbulence as an exigent for new ways of value creation and capture (Bodlaj & Čater, 2019; Christensen & Bower, 1996). Therefore, technological turbulence quests for fundamentally new product development processes, and thus, it is competence-destroying and calls for new capabilities and skills (König et al., 2021).

Consequently, in building an ambidextrous organisation, firms should understand that “technological innovation is a central engine of organisational adaptation” (Benner & Tushman, 2003, p. 242; O’Reilly & Tushman, 2013). However, Luger et al. (2018) postulate that at times, a firm’s contextual environment may demand organisations to depart from a state of ambidexterity and align with either explorative or exploitative innovation. Furthermore, Benner and Tushman (2003) argued that the contiguity of innovation can be classified in terms of the current technological trajectory. Therefore, in technological turbulence, distinct innovation types have

diverse organisational consequences, depending on their technological trajectory (Adner & Kapoor, 2016; Benner & Tushman, 2003).

For instance, exploitative innovation, characterised by small incremental changes in technological trajectory, builds on the currently existing competences (Benner & Tushman, 2003; Brown & Eisenhardt, 1997). Therefore, where technological turbulence influences incremental changes in a technology's trajectory, firms are more prone to engage in exploitative innovation, thus departing from a state of ambidexterity (Luger et al., 2018). Explorative innovation, on the other hand, is characterised by radical changes in a technology trajectory, which is competence-destroying (Benner & Tushman, 2003; König et al., 2021). Therefore, firms are more prone to accentuate exploration at the expense of exploitation, and thus move away from a state of ambidexterity (Luger et al., 2018).

Adner and Kapoor (2016) argue that technology exists and operates in an ecosystem. Therefore, one can posit that technological turbulence can also impact existing technology at a subsystem level (Adner & Kapoor, 2016; Benner & Tushman, 2003). Therefore, the impact that technological turbulence has on pre-existing technology's subsystem allows for further classification of innovation (Benner & Tushman, 2003). Benner and Tushman (2003) predicated that innovation can be further classified as modular and architectural.

2.8. The Moderating Role of Technological Turbulence

There are two streams of research in technological turbulence within models on innovation. One stream takes the contingency approach and examines the moderating role of technological turbulence, while the other one investigates it from a process perspective as an antecedent (Bodlaj & Čater, 2019). Scholars of entrepreneurship and organisational theory have all emphasised the significant influence technology has on organisational outcomes (Bodlaj & Čater, 2019; Saerom. Lee & Csaszar, 2020; O'Reilly & Tushman, 2013b). It is widely accepted that technological turbulence is one of the dynamic forces that influence industries' transformation, and strategic as well as organisational change (Bodlaj & Čater, 2019; Eggers & Francis Park, 2018; Saerom. Lee & Csaszar, 2020). Consequently, entrepreneurial orientation and organisational ambidexterity are essential skills for thriving in rapidly changing technological contexts (Bodlaj & Čater, 2019; Ferreras-Méndez et al., 2022; Rosenbusch et al., 2013). Yet, little is known about the moderating role of technological turbulence on the relationship between entrepreneurial orientation and organisational ambidexterity (Lee & Kreiser, 2018). Therefore, this study sought to fill this research gap.

The perceived technological turbulence describes the SMMEs' cognition of how quickly change occurs, but how difficult it is to predict changes in their industry's technology and whether these developments offer considerable potential for new product breakthroughs (Jaworski & Kohli, 1993; Wang et al., 2022). The lens of perceived technological turbulence and uncertainty is active in both entrepreneurship and organisational ambidexterity, as individual domains (Andrade et al., 2021; Bodlaj & Čater, 2019; Hughes et al., 2021).

Bodlaj and Čater (2019) accentuate the need for SMMEs to seize opportunities presented by technology and evolving settings. However, in this context, Slavec Gomezel and Aleksić (2020) explicate that firms must contend with these three factors: (1) uncertainty surrounding potential market prospects brought on by new technologies, (2) the complexity of turning technological innovations into successful customer-centric solutions, and (3) the ambiguities surrounding decisions of whether, when, and where to invest in new technologies, and the success or failure thereof. The frequency of unforeseen changes in the technological environment is a major source of uncertainty (Hina et al., 2021; Putniņš & Sauka, 2019). Therefore, these exogenous factors are considered and appraised by SMMEs, and consequently, have an impact on their entrepreneurial actions (Putniņš & Sauka, 2019; Slavec Gomezel & Aleksić, 2020). The perceived technological turbulence refers to SMMEs' perception of whether; (1) the technology in their industry is changing rapidly, (2) these changes are hard to forecast, and (3) whether these advancements present great opportunities for new product innovations (Hina et al., 2021; Santos et al., 2021).

Changes in technology are predictable in contexts with low technological turbulence. As a result, SMMEs often must contend with less uncertainty (Putniņš & Sauka, 2019; Slavec Gomezel & Aleksić, 2020). Therefore, the rate of technological change is perceived as slow and decisions about which technology to invest in and when to invest in it, are less challenging (Slavec Gomezel & Aleksić, 2020). Since technological turbulence is associated with shorter product life cycles (Ferreras-Méndez et al., 2022), one can posit that in low technological turbulence, business operations do not change drastically and the rate of product obsolescence is relatively low (Jafari-Sadeghi et al., 2021; Wang, 2008). Arguably, SMMEs are prone to enhance their existing products, so that they can effectively compete in existing markets (Wang, 2008). In this context, one can posit that SMMEs are more prone to engage in exploitative innovation comparative to exploratory innovation (Jafari-Sadeghi et al., 2021; Luger et al., 2018; C.L. Wang, 2008). Consequently, technological turbulence is expected to have a negative effect on the correlation between entrepreneurial orientation and organisational ambidexterity.

In contrast, settings with high technological turbulence present SMMEs with the challenge to keep up with the fast pace of change in technology and product obsolescence (Ferreras-Méndez et al., 2022; Wang et al., 2022). High technological turbulence may create opportunities for SMMEs to create novel products and secure superior competitive positions, while it may also lead to high failure rates (Bodlaj & Čater, 2019; Ferreras-Méndez et al., 2022; Jafari-Sadeghi et al., 2021). This view was also echoed by Teece (1986, 2010), who argued that firms often struggle to commercialise technological innovations. This argument was predicated on the view that most innovative firms "lament the fact that competitors/imitators have profited from the innovation more than the firm first to commercialise it" (Teece, 1986, p. 285). In addition, Wang et al. (2022) and Anderson and Tushman (1990) argued that high technological turbulence leads to technological discontinuities and obsolescence. This phenomenon results in competence destruction, and SMMEs are then more prone to explore new technologies and new product-markets (Anderson et al., 2019; Luger et al., 2018). Therefore, technological turbulence is expected to have a negative effect on the relationship between entrepreneurial orientation and organisational ambidexterity.

Luger et al. (2018) argued that most environments change over time, maintaining any given "exploration-exploitation balance would cause misalignment with the environment" (p. 450). Therefore, as argued above, in a low technological environment, SMMEs are more prone to exploit existing product-market opportunities, whereas in a highly technological turbulent environment, SMMEs are more prone to explorative innovations. This is predicated on the argument that for firms to survive, they ought to adapt to their environment (Duncan, 1972). Therefore, either of the two extreme continuums of technological turbulence will result in firms departing from a state of ambidexterity, thus experiencing a negative impact on the relationship between entrepreneurial orientation and organisational ambidexterity. As such, one can posit that technological turbulence will have a positive moderating effect on the relationship between entrepreneurial orientation and organisational ambidexterity, if the rate of turbulence is medium.

2.9. Conclusion

In Chapter 2, the literature review examined the conceptualisation of entrepreneurial orientation and its dimensions as well as the notion of organisational ambidexterity and the modes, through which organisations balance the exploration and exploitation continuum. The concept of technological turbulence was introduced as moderating role in the relationship between organisational ambidexterity and entrepreneurial orientation. Finally, the concept of disruptive innovation was used as a theoretical anchor for the study. The next chapter presents the hypotheses and the conceptual model formed for this study.

3. CHAPTER 3 - HYPOTHESES

3.1. Introduction

This study aimed to advance the body of knowledge already in existence, as outlined in Chapter 2, firstly; by clarifying the correlation between entrepreneurial orientation and organisational ambidexterity. Secondly, by examining technological turbulence as a moderator on the correlation between entrepreneurial orientation and organisational ambidexterity. Therefore, the hypotheses and conceptual model of the study are outlined in Chapter 3.

3.2. Conceptual Development

Previous studies on entrepreneurial orientation and firm performance examined moderator variables; however, only two of those studies investigated the moderating role of market turbulence (Engelen et al., 2014; Kraus et al., 2012). Therefore, the moderating role of technological turbulence has not been investigated (Lee & Kreiser, 2018). In addition, limited studies have investigated the moderating variables that strengthen the relationship between entrepreneurial orientation and organisational ambidexterity (Huang et al., 2021; Lee & Kreiser, 2018). As such, the examination of technological and market turbulence, as moderating variables, will give valuable insights on the strength of the relationship between entrepreneurial orientation and organisational ambidexterity.

Furthermore, there are different views on the relationship between entrepreneurial orientation and organisational ambidexterity (Covin & Wales, 2019; Rosenbusch et al., 2013; Wiklund & Shepherd, 2011). These mixed findings could be attributed to missing moderator variables in the studies. This sparks a debate as to whether technological and market turbulence moderates the correlation between entrepreneurial orientation and organisational ambidexterity (Covin & Wales, 2019; Huang et al., 2021; Lee & Kreiser, 2018). The suggested moderating effect of technological turbulence on the correlation between entrepreneurial orientation and organisational ambidexterity is depicted graphically in Figure 1's theoretical model.

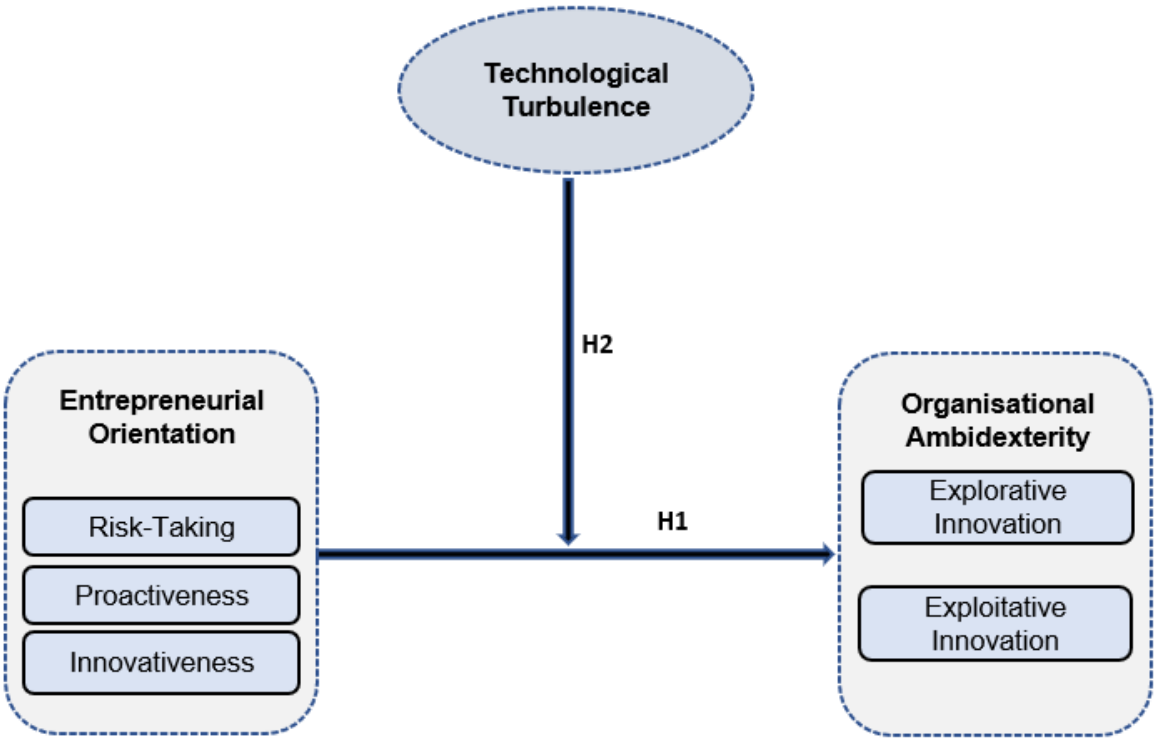

Figure 1: Conceptual Model

3.3. Hypotheses

3.3.1. Hypothesis 1

Entrepreneurial orientation is the firms' ability to engage in processes, practices, and decision-making that lead to new entrance, with "risk-taking, innovativeness, and proactiveness" as antecedents (Covin & Wales, 2019, p. 4; Huang et al., 2021). This captures the firms' ability to promote innovation, anticipate technological and market changes, and taking the leap to engage in unpredictable opportunities (Covin & Wales, 2019; Huang et al., 2021). Unpredictable and uncertain environmental contexts demand organisations to be ambidextrous in exploiting and exploring opportunities (Huang et al., 2021; Lee & Kreiser, 2018).

Given the mixed findings on the relationship between entrepreneurial orientation and organisational ambidexterity, the goal of the present hypotheses is to clarify this relationship (Covin & Wales, 2019; Huang et al., 2021; Rosenbusch et al., 2013; Wiklund & Shepherd, 2011). This will reveal whether entrepreneurial orientation complements organisational ambidexterity in securing the firm's competitive advantage and sustainable performance (Covin & Wales, 2019; Lee & Kreiser, 2018).

Therefore, Hypothesis 1 and its sub-hypotheses, postulate that:

H1: There is a positive relationship between entrepreneurial orientation and organisational ambidexterity

H1a: There is a positive relationship between risk-taking and organisational ambidexterity

H1b: There is a positive relationship between proactiveness and organisational ambidexterity

H1c: There is a positive relationship between innovativeness and organisational ambidexterity

3.3.2. Hypothesis 2

In technological turbulence, old "technologies become obsolete and new disruptive technologies substitute their place" (Iqbal et al., 2020). Commensurate to technological changes, the adoption of new technologies enables firms to adapt their capabilities, develop better products, and capture untapped customer bases (Iqbal et al., 2020). Yet, the extant literature has not examined technological turbulence as a moderating variable between entrepreneurial orientation and organisational ambidexterity (Engelen et al., 2014; Lee & Kreiser, 2018). Therefore, the purpose of this hypothesis and its sub-hypotheses is to close this academic gap in the extant literature. Therefore, Hypothesis 2 and its sub-hypotheses postulate that:

H2: Technological turbulence strengthens the relationship between entrepreneurial orientation and organisational ambidexterity

H2a: Technological turbulence strengthens the relationship between risk-taking and organisational ambidexterity

H2b: Technological turbulence strengthens the relationship between proactiveness and organisational ambidexterity

H2c: Technological turbulence strengthens the relationship between innovativeness and organisational ambidexterity

3.4. CONCLUSION

Chapter 3 presented the conceptual model of the study and the hypotheses. The following chapter will discuss the research method and design for this descriptor-explanatory study.

4. CHAPTER 4 - RESEARCH METHODOLOGY AND DESIGN

4.1. Introduction

In Chapter 4, the methodological choice and research design are presented. In addition, it describes the methodology used for the descriptive statistical analysis of the sample population. It then describes the statistical procedures used to assess the hypotheses described in Chapter 3. Finally, the limitations of the study are outlined.

4.2. Research Design

4.2.1. The philosophical underpinnings of the research

The decisions about the nature of reality (ontology), how knowledge is developed (epistemology), and how to access or gain this knowledge (methodology) were the major factors that shaped the research design of this study (Sousa, 2010). The purpose of this study was to develop a comprehensive understanding of the moderating role of technological and market turbulence on the relationship between entrepreneurial orientation and organisational ambidexterity. Therefore, using ontological realism as a foundation, the study adopted a positivist methodology (Leitch et al., 2010; Sousa, 2010). Positivism focuses on a quantifiable phenomenon with the intention that the dataset will be collected objectively, in evaluating the moderating role of technological and market turbulence on the relationship between entrepreneurial orientation and organisational ambidexterity (Leitch et al., 2010; Sousa, 2010; Zikmund et al., 2019).

A positivist philosophy is the foundation of quantitative research. This was one of the reasons for choosing a quantitative research method. Through comprehensive and thorough scientific examination, these procedures are effective in producing new knowledge (Rahi, 2017). The research evaluated the moderating role of technological turbulence on the relationship between entrepreneurial orientation and organisational ambidexterity using existing theory; therefore, positivism was considered appropriate for the study (Saunders & Lewis, 2012). The hypotheses were created and tested by using existing theory with the assumption that they would either be supported or disproved. As the positivist philosophy is the foundation of quantitative research, this was one of the reasons for choosing a quantitative method (Grinnell Jr & Unrau, 2010).

4.2.2. Research approach

In keeping with the positivist ethos, a deductive approach was employed to facilitate the examination of the hypotheses described in Chapter 3. The study tested theory by utilising the deductive method, gathering data from participants, and using statistical analyses to draw conclusions (Rahi, 2017). The deductive method was congruent with another quantitative research in the domain of entrepreneurial orientation (Rose & Mamabolo, 2019). The benefit of

positivism is that it avoids subjectivism and bias, which could have been detrimental to the reliability of this quantitative research study (Sousa, 2010).

In Chapter 2, it emerged that entrepreneurial orientation and organisational ambidexterity are well developed and mature constructs (Covin & Wales, 2019; Kang & Kim, 2020; Luger et al., 2018). This study consists of one independent variable (entrepreneurial orientation), one dependent variable (organisational ambidexterity) and one moderator variables (technological turbulence), which justified a deductive approach (Holmström et al., 2009). This research study intended to establish a theoretical proposition by testing hypotheses to confirm or refute whether technological and market turbulence moderate the relationship between entrepreneurial orientation and organisational ambidexterity. This was a crucial aspect of the deductive approach, along with gathering and analysing data to respond to the inquiry that can support or disprove existing theory (Saunders & Lewis, 2012).

4.2.3. Research type

This study is a descriptor-explanatory study that used statistical inference and descriptive analysis to understand the significance of correlations and effects between variables (Bell et al., 2022). The explanatory research method was chosen, as it allowed the researcher to gain deeper insights into the relationship between entrepreneurial orientation and organisational ambidexterity, and how this correlation was affected by the moderating role of technological turbulence. This research methodology was chosen for this study, because it relies and builds on existing theories and is primarily used to explore the factors that drive different phenomena (Cohen et al., 2002; Rahi, 2017). This also applies to quantitative approaches; therefore, statistical methods were employed to describe and explain the outcomes of this study (Rahi, 2017).

4.2.4. Methodological choices

A mono-method was employed in this research study (Saunders & Lewis, 2012; Sharma et al., 2009). The independent variable (entrepreneurial orientation) was postulated as a predictor of the dependent variable (organisational ambidexterity). The moderator variable (technological turbulence) was introduced to understand its impact on the relationship between the independent variable (entrepreneurial orientation) and the dependent variable (organisational ambidexterity). Therefore, the mono-method entailed the collection of quantitative data for statistical testing of the relationships that were hypothesised in Chapter 3 (Sharma et al., 2009).

4.2.5. Research strategy

Predicated on the guidelines of the deductive approach described above (Saunders & Lewis, 2012), the developed research strategy focused on determining statistical correlations between the independent variable, the dependent variable, and the moderator variable, as outlined in hypotheses developed in Chapter 3. As discussed above, the research aimed to analyse primary data gathered from SMME participants to establish the significance of the relationship between entrepreneurial orientation and organisational ambidexterity (Sharma et al., 2009). Technological turbulence was then introduced as a moderator variable to comprehend how the relationship between entrepreneurial orientation and organisational ambidexterity was affected in this context (Sharma et al., 2009). Therefore, a descriptor-explanatory research strategy was considered suitable for this study, because it entails explaining correlations between the above-mentioned variables (Saunders & Lewis, 2012).

Informed by the study's descriptor-explanatory framework, a structured survey research technique was employed (Roberts-Lombard & Petzer, 2018; Zikmund et al., 2019). This technique was acceptable for a study of a standardised form, where the survey was conducted using an online self-administered questionnaire (Zikmund et al., 2019). Attributable to its simplicity, this research strategy was deemed ideal for use in business research. The survey's data collecting tool's structure enabled the population sampled to experience similar data gathering settings, and it also increased the possibility of reaching more participants electronically to attain a statistically meaningful sample size (McCusker & Gunaydin, 2015; Zikmund et al., 2019). However, a good and reliable research study necessitates that the chosen sample be representative of the population and that participants respond to the survey in a timely manner (Saunders & Lewis, 2012).

4.2.6. Time horizon

A cross-sectional approach was chosen, because of the study's time constraints, even though observing a longitudinal approach would have allowed for understanding the progressive aspects of the correlation between the three constructs over a given timeframe (Köhler et al., 2017). Similar comparable research on entrepreneurial orientation and organisational ambidexterity, for example, were the cross-sectional studies conducted by Basco et al. (2020) and Luger et al. (2018). Therefore, a cross-sectional study was considered appropriate for the given timeframe (Köhler et al., 2017). Data regarding the moderating role of environmental turbulence on the relationship between entrepreneurial orientation and organisational ambidexterity was gathered over a short period of time (11 weeks), without accounting for how the constructs' relationships changed over time (Doyle et al., 2016; Köhler et al., 2017). Even though the data was gathered

from a variety of sources, given that the study was cross-sectional, there may be concerns regarding potential bias in the dataset (Donbesuur et al., 2020). As a result, quantitativetechniques to examine any potential bias in the dataset were performed.

4.3 Research Methods

4.3.1. Population

A complete set of data pertaining to a group that has common traits or characteristics, making up the entire whole, is referred to as a population (van Zyl et al., 2014). It was a crucial element of this study to precisely identify the relevant population to elicit direction of where the researcher should gather data to answer the research questions. It was argued in Chapter 2 that SMMEs play a crucial role in the South African economy as facilitators and catalysts of economic growth and development (Dele-Ijagbulu et al., 2020). However, as also discussed in Chapter 2, SMMEs' failure rate in South Africa is alarmingly high (Dele-Ijagbulu et al., 2020).

Chapter 2 explicated that technological turbulence presents opportunities and threats for these small firms, and as such, this required them to enhance their entrepreneurial orientation and organisational organisational ambidexterity skills to shape their future and survive (Covin & Wales, 2019; Hughes et al., 2021; Iqbal et al., 2020). Despite the importance of technology adoption, this study did not limit its population to SMMEs in the high-tech sector. This was predicated on Slavec Gomezel and Aleksić's (2020) argument that "technological turbulence may be perceived also in other sectors" that are not high-tech (p. 761). Organisations today are forced to function optimally within a digital environment, which is reshaping the entrepreneurial landscape, as discussed in Chapter 2 (Elia et al., 2020; Jafari-Sadeghi et al., 2021). Therefore, SMMEs established in South Africa and operating across all industries made up the population for this study. The definitions of these firms were drawn from an official publication by the Department of Small Business Development (2019) and this is outlined in Table 4.

Table 4: Classification of SMMEs in South Africa

SMME Classification	Total Full-time Equivalent of Paid Employees
Micro-Enterprise	0 – 10
Small-Enterprise	11 – 50
Medium-Enterprise	51 – 250

Source: Adopted from Department of Small Business Development (2019, p. 11)

The choice of micro, small, and medium-sized businesses improved the population's homogeneity, which had the crucial advantage of ensuring constancy of quality in the data collection (Doyle et al., 2016). Additionally, by excluding large organisations, the validity of the results was not compromised.

4.3.2. Unit of analysis

The study's unit of analysis was at a meso-level (Covin & Wales, 2019). Therefore, the participants of this study were business owners and managers who work in these SMMEs (Covin & Wales, 2019). This choice was considered to be acceptable, because business owners and managers would have better insights into their firms' organisational ambidexterity and entrepreneurial orientation (Covin & Wales, 2019; Hughes et al., 2021; Lavie et al., 2010). This choice was also in accordance with comparable studies on entrepreneurial orientation and organisational ambidexterity, such as Huang et al. (2021) and Hughes et al. (2021), where the managers who represent the organisation were used as participants in the research studies.

Therefore, the selection of the organisation as the unit of analysis and the use of owners and managers as study participants was considered acceptable for this investigation, as each response added a unique comprehension of the relationship between components and the research problem (Donbesuur et al., 2020).

4.3.3. Sampling method and size

Two non-profit organisations, which promote the development of SMMEs in South Africa were contacted by email and telephonically for a quest of access to their SMME database. However, neither institution allowed the researcher access to their databases. This meant that a complete population of South African SMMEs could not be obtained within the timeframe of this research study. The implication of this limitation was that the study began without a target sampling frame

(Zikmund et al., 2019). As a result, and for pragmatic reasons, a purposive and non-probability sampling technique was used instead of a probability sampling approach.

The study collected data regarding the owners and managers' understanding of the correlation between entrepreneurial orientation and organisational ambidexterity, moderated by environmental turbulence. Therefore, non-probability sampling demanded a broad representation of the appropriate participants of the study (Vehovar et al., 2016; Zikmund, 2019). In addition, and attributed to the high failure rate of SMMEs in South Africa, the study did not narrow down the sampling process to a specific industry (Dele-Ijagbulu et al., 2020) to obtain an overview of how the technological turbulence moderates the relationship between entrepreneurial orientation and organisational ambidexterity.

Purposive sampling was used, which meant that participants were chosen based on their ability to meet the sample criteria, which consisted of SMME owners or managers employed by SMMEs (Köhler et al., 2017; Vehovar et al., 2016). Therefore, the outcomes of the study will not be able to be generalised to a larger population using statistical inference (Vehovar et al., 2016). As the study examined the moderating role of technological turbulence on entrepreneurial orientation and organisational ambidexterity, Green's (1991) equation was employed to determine the minimum sample size:

$$N \geq 50 + 8p$$

Where N is the sample size, and p is the exploratory variable (independent variables) in the study (Green, 1991). The moderator variable, technological turbulence, was treated as having two variables, based upon its moderating role, while entrepreneurial orientation had three variables (innovativeness, risk-taking, and proactiveness). This provided an N value of 90, and in addition, 20% was factored in to consider the possibility of non-responses as well as time to reach a minimum sample of 100 for a structural equation model (Hair et al., 2017; Sarstedt et al., 2021). Therefore, the minimum sample size for this study was 108. This sample size was considered reasonable, because it fell within the range of sample sizes of similar research studies on entrepreneurial orientation and organisational ambidexterity that met statistical significance. These studies' samples were 114 in China, 102 in Mexico, and 114 in Spain (Basco et al., 2020) as well as 211 in (Hughes et al., 2021).

4.3.4. Measurement instrument

SMMEs in South Africa are geographically, and widely dispersed; therefore, to be able to reach as many as possible SMMEs across South Africa, the researcher decided to conduct online research by employing Google Forms, an online questionnaire as a measurement instrument for generating the quantitative data for the research study (Zikmund et al., 2019). Through a positivist philosophical lens, questionnaires enabled the researcher to gather standardised and structured data from these survey participants and enabled explanatory research to test the theory and relationships (Sousa, 2010; Zikmund et al., 2019).

The research strategy was based on a deductive method; therefore, it relied on instruments already in use to test each construct. The online survey questionnaire was made up of a variety of question blocks that were organised by the categories being measured, and used five-point Likert scales (Chyung et al., 2007). A consent letter was included in the survey, which explained the purpose of the study and accentuated that participation was voluntary, confidential and could be seized at any time without any penalties. Please refer to Appendix 2 for an exhibit. The measurement instrument was operationalised as discussed below.

Independent variable

Entrepreneurial orientation was the independent variable in this study. The independent variable, entrepreneurial orientation, was defined as the firms' "processes, practices, and decision-making activities that lead to new entry" (Covin & Wales, 2019, p. 4). The measurements of entrepreneurial orientation (innovativeness, proactiveness, and risk-taking) were adopted from Huang et al. (2021). However, Huang et al. (2021) adapted the measurement scale from Covin and Slevin (1989), who originally developed it. The measurement scale had 15 items that measured the firms' behaviour, which leads to new entry (Covin & Slevin, 1989; Covin & Wales, 2012). Please refer to Appendix 3. Prior studies (Wiklund & Shepherd, 2003) had measured entrepreneurial orientation on a 9-point Likert scale, where Wiklund and Shepherd (2005) had set a Cronbach's alpha of 0.75. In this study, entrepreneurial orientation was measured on a 5-point Likert scale ranging from strongly agree to strongly disagree (Chyung et al., 2007). This study's measurement scale of the independent variable (entrepreneurial orientation) produced reliable data.

Dependent variable

Organisational ambidexterity was the dependent variable in this study. Organisational ambidexterity was defined as "the ability of an organisation to simultaneously pursue both explorative (discontinuous) and exploitative (incremental) innovation" (Junni et al., 2013, p. 299). The measurements of organisational ambidexterity (explorative and exploitative innovation) were adopted from Jansen et al. (2006). The measurement scale had 16 items, which measured the firms' ability to simultaneously engage in explorative and exploitative innovations (Jansen et al., 2006). Please refer to Appendix 3 for an exhibit. Organisational ambidexterity was measured on a 5-point Likert scale, ranging from strongly agree to strongly disagree (Chyung et al., 2007). Jansen et al. (2006) found that the following Cronbach's alpha; exploratory innovation = 0.86 and exploitative innovation = 0.80, respectively were reliable. The measurement scale for the dependent variable generated reliable data.

Moderator variable

Technological turbulence was introduced in the study as a moderator variable, and it was defined as "the rate of technological change and unpredictability, which is characterised by the instability and rapid obsolescence of technologies" (Wang et al., 2022, p. 1440). The 14-item measurement scale for this study was adopted from the following scholars, whose studies measured technological turbulence; Hina et al. (2021), Lisboa et al. (2011), Santos et al. (2021) and Wu et al. (2017). In congruence with Hina et al.'s (2021) study, technological turbulence was measured on a 5-point Likert scale, ranging from strongly agree to strongly disagree (Chyung et al., 2007). Santos et al. (2021) reported a Cronbach's alpha of 0.78 and the scale generated reliable data.

Control variables

The country where the SMME business was established, and the class of the enterprise were chosen as control variables to ensure that the relevant dataset for this study could be analysed statistically. The classification of SMMEs was determined as based on the guidelines of the Department of Small Business Development (2019).

4.4. Data Gathering Process

The questionnaire was submitted to the Ethical Clearance Committee for approval before pilot-testing, mailing out the questionnaires and data collection commenced. After receiving ethical clearance, which is detailed in Appendix 1, the survey was pre-tested among managers from 12 SMMEs (Zikmund, 2019). They were selected based on how quickly and easily they could provide feedback. The pilot group was not divergent from the target population to ensure that they

understood the questions (Zikmund, 2019). Nine responses were received with the request to change Google Form settings, as they could not go past the demographic section. Once this was corrected, the second feedback was that participants could select more than one answer per question. The settings were subsequently changed to limit responses to one selected answer per question, and this ensured the collection of accurate data. Pre-test responses were not included in the study's final analysis. The final questionnaire was designed such that it took participants approximately 15 minutes to complete the survey and this was indicated on the consent page. The participants were assured that their responses would be treated confidentially, and aggregated data would be reported, please refer to Appendix 2.

Once the instrument had been tested and amended according to the results from the pilot test, it was then distributed to SMMEs by sharing the link to the Google Forms questionnaire through the following platforms: emails, LinkedIn, Facebook, WhatsApp, and Telegram (Zikmund, 2019). Please refer to Appendix 3 for the online questionnaire. The delivery of the questionnaire would not have been as timely without the use of a self-administered online survey as a distribution channel, which overcame logistical and geographic constraints.

The survey was distributed via snowballing procedures through LinkedIn, Facebook, and various WhatsApp groups. Emails of SMMEs were obtained from the Innovation Hub's website. Since the emails of alumni SMMEs are publicly available information, no permission was necessary to be obtained from any other source. The Innovation Hub offers several incubation programmes in the green economy and smart industries, which include advanced manufacturing, and the information and communications technology (ICT) sector. The first round of emails was sent out in July 2022 and follow-ups were conducted in August 2022. A list of 70 MBA students, who fit the target profile for SMMEs was created, leveraging on the researcher's social capital. The survey was then distributed to this group, through WhatsApp, in August 2022 and follow-ups were conducted on a weekly basis in September 2022. Finally, the collected data was stored electronically, and back-up copies were securely kept separate from the original file on Google and One Drive, to mitigate against the risk of loss or theft (Zikmund, 2019).

4.5. Data Analysis Approach
4.5.1. Data preparation

A 5-point Likert scale was used to gather the data, making it statistically categorised as being of a quantitative, numerical, and discrete quality (Wegner, 2020). The online survey platform allowed continuous data to be exported to Microsoft Excel (Excel), where data was combined, based on the questions and answers. However, to allow for a descriptive statistical analysis, the collected data had to be coded into numeric values, because the Excel file featured both string text and numeric data (Zikmund, 2019). The results from the Likert scale ratings were changed to numerical values, where: 1 = strongly agree, and 5 = strongly disagree, and the numbers 2 to 4 being the other provided options on the scale (Zikmund, 2019). The string text presentation of categorical and ordinal data, such as enterprise classification and the number of employees, necessitated conversion to numeric values for the quantitative statistical analysis (Zikmund, 2019). The coded raw data was analysed and all responses from participants who did not match the inclusion criteria were excluded from this study, as outlined in Chapter 5.

Missing data

For statistical analysis, it is a requirement to have a complete dataset, with no missing values. Unfortunately, this study's dataset did not meet this requirement (Blunch, 2015). Newman (2014) defines missing data as a statistical issue that “manifests as an incomplete data matrix resulting from one or more participants, in a sample frame, who do not answer to one or more survey items” (p. 373). Newman (2014) argues that most missing data is the result of survey non-response, which might range from a deliberate choice to ‘skip a single item’ to participants forgetting to complete the entire survey as they are too busy. Technical issues with the data collection instrument could also result in missing data. In addition, Newman (2014) posits that missing data correlates to three tiers: “item-level missingness, construct-level missingness, and person-level missingness” (p. 374).

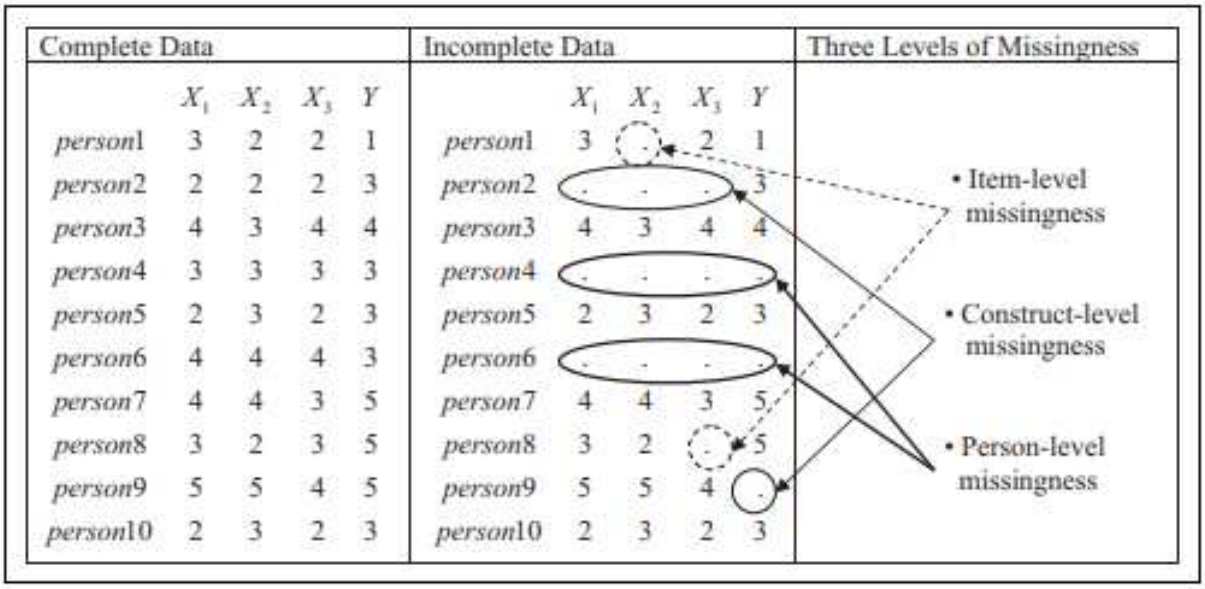

Figure 2: The Three Levels of Missing Data

Source: Newman (2014)

As demonstrated in Figure 2 above, item-level missingness occurs, when a participant skips one or more questions for a variety of reasons, such as sensitivity to the question, unfamiliarity with information and something they do not know, or being unintelligible (Newman, 2014; Schafer & Graham, 2002). Construct-level missingness occurs, when the participant does not respond to items on the scale, which could manifest, where an entire construct is not responded to or a participant skipping the entire scale (Newman, 2014). Finally, person-level missingness manifests, where a participant fails to complete any part of the survey (Newman, 2014; Schafer & Graham, 2002).

To mitigate the risk of bias arising from the missingness of data, the researcher performed a missing data analysis (Newman, 2014). As a result, the researcher observed that the missing data occurred in this study as an item-level missingness and it was classified as missing completely at random (MCAR), because the missingness pattern was independent of the relevant variable (Newman, 2014; Schafer & Graham, 2002). The missing data was natural and unavoidable; it was a result of the ethical principle the researcher applied in terms of respect for persons and that the participation in the study was voluntary (Newman, 2014). Considering that in research, there will always be missing data, the researcher considered the minimum acceptable levels of missingness of data, without it introducing a bias into the results. Schafer (1999) conservatively asserted that missing data of 5% or less would be inconsequential, whereas

Bennett (2001) argued that a threshold of 10% or less was acceptable (Dong & Peng, 2013). However, the researcher opted for the most conservative approach and employed a threshold of 5% or less as an acceptable level of missing data (Dong & Peng, 2013; Schafer, 1999).

The missing data could not be sourced by other means, therefore, the researcher was left with the following choices; (1) employ case deletion (listwise) to eliminate the cases that contained missing data, and this would result in a reduced sample size, or (2) take a process of imputation (pairwise) and leave the missing data fields open and where applicable these would not count in data analysis unless there were many of them (Hair Jr. et al., 2019; Scheffer, 2002). The researcher employed imputation, without replacing the missing values, because this minimised bias and used datasets that would otherwise be discarded (Hair Jr. et al., 2019; Schafer & Graham, 2002; Scheffer, 2002). Watkins (2018) posits that research on imputation techniques demonstrates that any method is effective when there is less than 5% missing data. Therefore, the missing value analysis was conducted to determine that it satisfied Schafer's (1999) conservatively proposed threshold of 5% or less, as an acceptable level of missing data (Hair Jr. et al., 2019; Watkins, 2018), as set out in Chapter 5.

4.6. Statistical Analysis

4.6.1. Descriptive statistics

Demographic data gathered in the survey enabled the researher to run descriptive statistics, which provided insight and a comprehension of the properties of the constructs tested in this study. The outcomes comprised the overall trend, outlier presence, dispersion, and skewness. In Addition, the analysis was employed to ascertain the variance , frequencies, and describe the data's profile. Chapter 5 presents the descriptive statistics, and the quantitative techniques that were carried out to characterise the study's sample population as described below.**Normality**

The normal distribution of the data, which is a fundamental presumption for most statistical tests, means that the normality in the dataset is a consequence of how the data is distributed about the mean, which serves as an identifier of a middle point (Cramer & Howitt, 2004). The interpretations and conclusions are rendered invalid and unreliable when the normality of the data is compromised. To determine if a dataset follows a normal distribution, one of three methods can be applied (Razali & Wah, 2011).

Normality can be computed in several ways, including skewness and kurtosis, the Shapiro-Wilks test, and the Kolmogorov-Smirnov test, among others. The researcher employed skewness and kurtosis to obtain a view of the normal distribution of data (Hair Jr. et al., 2019; Watkins, 2018).

Skewness describes the symmetry of the score distribution, whereas kurtosis quantifies how tall the score distribution is in respect to its width (Watkins, 2018). The acceptable critical values were -1.96 and +1.96, which corresponds to a 0.05 error level (Hair Jr. et al., 2019). The researcher would not run the most conservative method such as the Shapiro-Wilks test, considering that the study had already employed structural equation modelling (PLS-SEM), which is flexible and makes provision for non-normality. Since AMOS would not be employed, there was no need to run multiple tests to determine whether the data was normally distributed or not, as the researcher was using a statistical program that did not require normality.

The assumptions of AMOS were already violated; however, PLS-SEM is flexible on the normal distribution of data. Nonetheless, skewness and kurtosis demonstrated that the data was normally distributed as depicted in Chapter 5. Therefore, the purpose of performing tests for normality was to determine whether the study required the use of Pearson's correlation, or if it required the use of Spearman's correlation. This procedure was relevant for the below section on the correlation matrix.

Extreme outliers

Extreme outliers are values beyond the predicted population values for a single variable and far from most cases in the normal distribution of that variable (Mowbray et al., 2019). If not properly identified, outliers can negatively affect the validity of the study (Hair Jr. et al., 2019; Mowbray et al., 2019). The Z-score is one of the possible ways for determining extreme outliers in the dataset. It is the number of standard deviations away from the mean where a certain data point is (Mowbray et al., 2019). Therefore, the researcher employed the Z-score to assess the extreme outliers and treated these with a deletion technique (Mowbray et al., 2019).

4.6.2. Multivariate statistical analysis

Aligned with this study, the primary objective of multivariate statistical techniques is to expand the researcher's explanatory ability. There were more than three variables in the dataset. Therefore, it was subjected to multivariate statistical analysis to ensure its accuracy and validity (Hair Jr. et al., 2019). Selecting the appropriate multivariate statistical analysis technique depends on three characteristics of a research study: (1) The aptitude to separate the constructs into dependent and independent variables, (2) the ability to identify the number of dependent variables that are in the study, and (3) the measurement methods of each variable (Hair et al., 2010).

This study had dependent variables that needed to be explained or predicted by independent variables; hence, a dependence technique was appropriate, as outlined in Chapter 3. The researcher employed the structural equation modelling (SEM) technique, which examines the structure of interrelationships through visualisation and model validation (Dash & Paul, 2021; Hair Jr. et al., 2019). The researcher employed SEM, because its equations depict all relationships among dependent and independent variables, and moderators. This choice was aligned with the research study (Hair Jr. et al., 2019), as outlined in Chapter 3. Furthermore, SEM can incorporate latent variables into the analysis (Hair Jr. et al., 2019). Albeit linear regression could have been employed to test hypotheses in this study, it cannot examine the relationships between latent variables or test their reliability (Hair et al., 2010).

There researcher had two available options for running the SEM; (1) through the covariance-based Structural Equation Model (CB-SEM) or (2) the Partial Least Squares-based Structural Equation Model (PLS-SEM) (Dash & Paul, 2021; Hair Jr. et al., 2019). The CB-SEM is more stringent and conservative, as it runs through the Analysis of a Moment Structures (AMOS) (Dash & Paul, 2021; Hair Jr. et al., 2019). It has critical minimum guidelines that are required; a minimum sample size of 200, data must be normally distributed, and should have no missing values (Dash & Paul, 2021). However, a combination of these requirements was violated by the dataset, since it contained missing values and the sample size was less than 200. This meant that if AMOS had been employed, it would not have given an appropriate model fit (Dash & Paul, 2021). Therefore, the researcher employed PLS-SEM, because it is flexible, it accepts missing data and a minimum sample size of 100 (Hair Jr. et al., 2019; Sarstedt et al., 2021). The sample size for the study is detailed in Chapter 5.

To this end, the constructed dataset was imported into the IBM Statistical Package for Social Sciences (SPSS) version 28 plus Smart PLS version 4, to setup additional parameters for descriptive statistical analysis (Dash & Paul, 2021). The program was set to a standard confidence level of 95% and the variable types, and data labels were correctly classified (Blunch, 2015). In applying SEM, the researcher employed two structures: (1) the measurement model, and (2) the structural model. The measurement model ran confirmatory factor analysis (CFA) and the structural model ran the relationship to test the hypotheses (Hair Jr. et al., 2019). These two structures are discussed in the below sections.

4.6.2.1. Structural equation modelling

The structural model was specified prior to conducting the PLS-SEM technique. PLS-SEM is structured into two parts; (1) The measurement model, which is also known as the outer model, and (2) the structural model is termed the inner model (Hair Jr. et al., 2019). Similar to multiple regression equations, the structural model analyses the interrelationships' structure through a series of equations. The measurement model defines the latent constructs or variable.

Measurement model assessment

Exploratory factor analysis (EFA) seeks to identify the fundamental structure of variables by investigating their shared unobserved sources of influence, which are correlated into component-like groupings (Hair et al., 2021; Hair Jr. et al., 2019). In a subsequent phase, another form of factor analysis, known as confirmatory factor analysis (CFA), was implemented (Hair Jr. et al., 2019). A CFA establishes correlations from indicator to factor, while an exploratory factor analysis lets indicators from all factors load together without any restraint (Hair Jr. et al., 2019). Despite the conceptual differences between a CFA and an EFA, these two factor analyses "are complimentary rather than competitive", as posited by Cudeck (2000, p. 294).

Since EFA is supplementary to CFA, it is helpful to ascertain, if measures are measuring more than one construct. It is also typically the initial step in determining, whether a measure measures a latent construct before a CFA is undertaken (Collier, 2020). Considering that the questionnaire was adopted from Likert scales that already existed, but were created in a different setting, an EFA was performed to identify latent variables that could parsimoniously explain the covariation observed between a set of reflective indicators (Hair Jr. et al., 2019; Watkins, 2018) and to assess the sample adequacy and validity through the Kaiser Meyer-Olkin (KMO) test. The rest of the survey questions were condensed into their dimensions and constructs, using principal component analysis after evaluating the validity, reliability, and model fit (Hair Jr. et al., 2019). The reflective exploratory factor analysis was analysed by using principal components analysis with varimax rotation. Initially, the appropriateness of the factor analysis was evaluated using KMO and Bartlett's test for sphericity (Watkins, 2018). Items had to meet the criteria of at least one correlation over 0.5 and a KMO measure of sampling adequacy for greater than 0.5 to qualify for a dimension reduction (Blunch, 2015).

Entrepreneurial orientation, organisational ambidexterity, and technological turbulence are latent variables that are unobservable and cannot be measured "using secondary, observable information" (Davvetas et al., 2020, p. 254). A latent construct is a hypothesised and unobserved

concept that can be represented by measurable variables (Davvetas et al., 2020). In order to be operationalised at an observable level for empirical research, the construct must be at a higher level of unobservable abstraction, a measurement model then describes the correlation between the construct and its measurements (Hair Jr. et al., 2019). Usually, the participants' scores on items that are observable variables in a survey are used to measure these constructs (Davvetas et al., 2020). Such constructs can be measured using a formative or reflective measurement method (Coltman et al., 2008).

While Anderson et al. (2015) advocate that entrepreneurial orientation should be measured as formatively, Covin and Wales (2019) clarify that entrepreneurial orientation can be measured using a reflective or a formative model. Therefore, for the purposes of this study, an assessment was conducted to determine if the relationship between the indicator variables and the latent constructs were formative or reflective (Hair Jr. et al., 2019). The below table demonstrates the framework, which was employed in determining whether a reflective or formative model is applicable. This was followed by reliability tests and by a confirmatory factor analysis, which was performed for all constructs that were reliable (Hair Jr. et al., 2019). The confirmatory factor analysis included composite reliability, convergence validity and discriminant validity (Hair Jr. et al., 2019). The remaining survey items were condensed into their dimensions and constructs by principal component analysis after the validity, reliability, and model fit were evaluated.

Table 5: A Framework for assessing reflective and formative models

Reflective Model	Formative Model
Nature of the construct Latent construct exists independent of the measures used	**Nature of the construct** Latent construct is a combination of its indicators
Interchangeability of construct Items are manifest by the construct: ➢ Items share a common theme ➢ Items are interchangeable ➢ Adding or dropping an item does not change the conceptual domain of the construct	**Interchangeability of construct** Items define the construct: ➢ Items need to share a common theme ➢ Items are not interchangeable ➢ Adding or dropping an item may change the conceptual domain of the construct
Intercorrelation ➢ Items should have high positive intercorrelations ➢ Empirical tests include internal consistency and reliability which is assessed by Cronbach's alpha, average variance extracted, and factor loadings	**Intercorrelation** ➢ Items can have any pattern of intercorrelation, but should possess the same directional relationship ➢ No empirical assessment of indicator reliability possible
Collinearity ➢ Identify and extract measurement error by common factor analysis	**Collinearity** ➢ Use of vanishing tetrad test to determine if formative items behave as predicted ➢ Collinearity is ruled out by standard diagnostics such as the condition index

Source: Adopted from Coltman et al. (2008, p. 1252)

Reliability testing

Indicator Reliability

To determine the reliability of an indicator, the first stage in the reflective measurement model was the assessment to determine how much of the variance of each indication was explained by its construct (Hair et al., 2021). To determine an indicator's explained variance, the researcher squared "the indicator loading, which is the bivariate correlation between the indicator and the construct" (Hair et al., 2021, p. 77). Therefore, the indicator reliability indicated the collectiveness of an indicator. The acceptable threshold greater than 0.708 provided an acceptable indicator reliability, because they demonstrated that the construct explained more than 50% of the indicator's variance (Hair et al., 2019a; Hair Jr. et al., 2019).

Construct Reliability

The researcher then determined the constructs' internal consistency reliability. "The extent to which indicators measuring the same construct" are related to one another is known as internal consistency reliability (Hair et al., 2021, p. 77). The composite reliability (rho_c) is one of the fundamental techniques in PLS-SEM, in which high values mean that there is a high level of reliability (Hair et al., 2021). The following formula, which denotes the indicator measurement errors for either endogenous or exogenous constructs, measures the composite reliability:

$$CR = \frac{(\sum_{i=1}^{n} \lambda_i)^2}{(\sum_{i=1}^{n} \lambda_i)^2 + (\sum_{i=1}^{n} \varepsilon_i , \delta_i)}$$

However, this formula is sensitive to the size of the measurement scale, because it presupposes that all variables are standardised before being entered into a confirmatory factor analysis. As such, Gaskin proposed the following formula as an alternative to the above, and this was employed in this study:

$$CR = \frac{(\sum_{i=1}^{i} \lambda_i)^2}{(\sum_{i=1}^{i} \lambda_i)^2 + (\sum_{i=1}^{i} 1 - \lambda_i^2)}$$

Another internal consistency reliability measure used in the study was Cronbach's alpha (Bonett & Wright, 2015). The same criteria as the composite reliability (rho_c) were assumed by this measurement (Hair et al., 2021). Cronbach's alpha, also known as tau-equivalence, has a significant flaw in that it presumes that all indicator loadings in the population are equal (Hair et al., 2021). When this assumption is violated, it usually results in lower reliability values than those produced by composite reliability (Bonett & Wright, 2015). However, "even in the absence of tau-equivalence, Cronbach's alpha is an acceptable lower bound approximation of the true internal" consistent reliability (Hair et al., 2021, p. 78). The following formula was employed to determine the tau-equivalent reliability.

$$\rho_T = \frac{k^2 \overline{\sigma_{ij}}}{\sigma_X^2}$$

ρ_T = tau-equivalent reliability

k = number of items

σ_{ij} = covariance between Xi and Xj

σ_X^2 = item variances and inter-item covariances

Cronbach's alpha is rather conservative (Bonett & Wright, 2015; Hair et al., 2021). At the same time, composite reliability may be too liberal. Thus, a construct's true reliability should ideally be viewed within these two extreme values (Bonett & Wright, 2015; Hair et al., 2021). As the precise reliability coefficient typically falls "between the conservative Cronbach's alpha and the liberal composite reliability", using both deemed as an acceptable trade-off between the two measures (Hair et al., 2021, p. 78). Scores for composite reliability and Cronbach's alpha range from zero to one, with higher values indicative of more reliability (Hair et al., 2010). Values that range from 0.60 to 0.70 were deemed acceptable for reliability, whereas results between 0.70 and 0.95 represented satisfactory to good reliability levels (Hair et al., 2019, 2021). Any results above 0.95 indicated that the items were redundant (Hair et al., 2021; Hair Jr. et al., 2019).

Validity testing

Content Validity

Content validity, also known as face validity, is a form of construct validity, which assesses the correspondence of the variables that were included in the scale and its conceptual definition (Hair et al., 2021; Hair Jr. et al., 2019). The use of content validity ensured that the scale items extended past empirical issues to also match the definition of the constructs (Hair et al., 2021; Hair Jr. et al., 2019).

Construct Validity

The researcher evaluated construct validity after confirming that the scale complied with its conceptual definition, was unidimensional, and satisfied all three levels of reliability (Hair Jr. et al., 2019). A test's ability to measure a certain construct it is designed to measure is known as construct validity (Hair Jr. et al., 2019). The two sub-types of construct validity employed in this study were convergent and discriminant validity.

Convergent Validity

Convergent validity demonstrates a correlation between two measurements that are meant to measure the same construct (Hair Jr. et al., 2019). The average variance extracted (AVE) for all indicators for each construct is the metric that the study employed to assess the convergent validity of each construct (Hair et al., 2021; Hair Jr. et al., 2019). The AVE, defined as "the grand mean value of the squared loadings of the indicators associated with the construct" (Hair et al., 2021, p. 78). The AVE was determined through the following formula:

$$AVE = \frac{\sum_{i=1}^{n} \lambda_i^2}{n}$$

As a rule of thumb, the minimum acceptable AVE for the study was 0.50 or higher. An AVE of 0.50 or higher indicates that on average, the construct explains 50% or more of the variance of its indicators (Hair Jr. et al., 2019), as detailed in Chapter 5.

Discriminant Validity

Discriminant validity demonstrates the truancy of a relationship between two measures that are not meant to be related (Hair Jr. et al., 2019). Fornell and Larcker's (1981) criterion was employed to test the discriminant validity. The heterotrait-mono ratio (HTMT) of correlations was also used to test discriminant validity (Hair et al., 2021; Henseler et al., 2015). A conservative value of 0.85 was used in the study as a threshold for determining discriminant validity, with values below threshold considered valid (Hair Jr. et al., 2019, Kline, 2011). The results are set forth in Chapter 5.

4.6.3. Correlation matrix

Correlation matrix are used as inputs for confirmatory factor analysis and structural equation models. The correlation matrix was conducted to understand the correlation of all six constructs and their results, which were assessed for statistical significance at 95% ($p < .05$) and 99% ($p < .01$), the direction which is either positive or negative and the strength as per guidelines of Pallant (2010), where $0.09 \leq r \leq 0.29$ (weak), $0.30 \leq r \leq 0.49$ (medium) and $r \geq 0.50$ (strong).

4.6.4. Structural model assessment
Assumptions of structural model analysis

As with all statistical tests, structural equation modelling requires that certain underlying assumptions be satisfied to ensure accurate inferences, and these are discussed below.

Non-Normality

It is a fundamental tenet of structural equation modelling that observations come from a continuous, and multivariate normal population (Kumar & Upadhaya, 2017). This assumption is especially crucial for maximum likelihood estimation, because the maximum likelihood estimator is derived from the equation for the multivariate normal distribution (Kumar & Upadhaya, 2017). Therefore, this study employed the estimation technique as per the skewness and kurtosis of data in hand, and this assumption was satisfied.

Missing Data

Statistical techniques such as structural equation modelling presumptively have complete data for each unit of analysis (Kumar & Upadhaya, 2017). There should be no missing data in any variable, to put it simply. Units may, however, be missing values for one or more of the investigated variables for a variety of reasons (Kumar & Upadhaya, 2017). Therefore, the missing value analysis was performed, and this assumption was satisfied as detailed in Chapter 5.

Measurement Errors

The model fit is affected by measurement errors resulting from skewed data gathering methods and tools, as well as mistakes made by participants (Kumar & Upadhaya, 2017). The standard error is also affected by the dataset's variation (Kumar & Upadhaya, 2017). The standard error declines as the variance rises, undermining the assumption of normality of data (Kumar & Upadhaya, 2017). Therefore, the study assessed the variables for common method bias (CMB) and this assumption was satisfied as detailed in Chapter 5.

Structural equation model

The researcher examined the structural model based on Hair Jr. et al. (2019) and Chin's (2010) recommendations, after determining that the measurement model produced satisfactory results based on the reliability and validity tests. The following standard assessment criteria were considered; "The coefficient of determination (R^2), the blindfolding-based cross-validated redundancy measure (Q^2), the statistical significance and the relevance of the path coefficients"

(Hair et al., 2019, p. 11). To ensure that collinearity did not skew the regression results, it was addressed prior to evaluating the structural correlations (Hair et al., 2019; Hair Jr. et al., 2019).

After determining that collinearity was not a problem, the researcher assessed the endogenous constructs' R^2 values (Hair et al., 2019). The explanatory power of the model is determined by the R^2, also known as the in-sample predictive power, which measures the variance that is explained by each endogenous construct (Hair et al., 2019). Higher values of R^2, which has a range from 0 to 1, indicate predictive power and the model's greater explanatory power (Hair et al., 2019). The R^2 values of 0.75, 0.50, and 0.25 can be regarded as substantial, moderate, and weak, respectively, as a rule of thumb (Hair et al., 2019). However, the R^2 values should always be interpreted within the context of the study, because the more predictor constructs the research study has, the higher the value R^2 becomes (Hair et al., 2019).

The Q^2 value is another method of assessing the PLS path model's predictive accuracy, which was employed in the study (Chin, 2010; Hair et al., 2019). This computation is based on a blindfolded method that eliminates points from the data matrix, adds the eliminated points to the mean, and approximates the model variables (Chin, 2010; Hair et al., 2019). Higher Q^2 values are indicative of higher predictive accuracy, which results from small differences between the original and predicted values (Hair et al., 2019). The Q^2 values for a particular endogenous construct should, as a rule of thumb, be greater than zero to demonstrate the structural model's predictive accuracy for that construct (Hair et al., 2019). As a guideline, Q^2 values higher than 0, 0.25 and 0.50 "depict small, medium and large predictive relevance of the PLS path model" (Hair et al., 2019, p. 12).

The structural equation model (SEM) is a class of statistical models that attempts to explain the relationships between multiple variables. SEM analyses the structure of interrelatedness expressed in a set of equations, analogous to a series of multiple regression equations. The SEM was employed to measure the significance of the correlation between entrepreneurial orientation (dependent variable) and organisational ambidexterity (independent variable).

This procedure is aimed to test H1, H1a, H1b, and H1c. To determine the significance of the relationship between entrepreneurial orientation and the dimensions of organisational ambidexterity; entrepreneurial orientation was tested at a unidimensional construct, whereas organisational ambidexterity was tested at a multidimensional level. SEM was employed to test Hypothesis 1 and the analyses validated the predictive model to ensure a good predictive quality, which was indicated by a Q^2 value above 0.

Taking entrepreneurial orientation as a multidimensional construct, the sub-hypotheses (H1a, H1b, and H1c) were tested through SEM and a predictive analysis was performed to determine whether the model had a good predictive quality, indicated by a Q^2 value above 0. This was confirmed by the linear model (LM_RMSE), which had higher values than the error (PLS-SEM_RMSE) and fit (PLS SEM_MAE) values.

4.9. Limitations

This study has various drawbacks related to the data gathering and analysis procedure, as is the case with most quantitative studies (McCusker & Gunaydin, 2015). The limitations are set out and discussed below.

4.9.1. Bias

One drawback of the online survey tool used to record participants' impressions and insight was that some bias would be present in the results (Doyle et al., 2016). This anticipation manifested itself, because of the participants' self-reporting method of data collection (McCusker & Gunaydin, 2015). Albeit statistical steps were employed to mitigate the bias limitation, the dataset may still contain some bias that could affect the robustness of the results (Doyle et al., 2016; Köhler et al., 2017).

4.9.2. Sample Method

Since there was no sampling frame available when the study began, a probability sampling technique could not be used (Vehovar et al., 2016, Zikmund, 2019). Consequently, a non-probability, purposive sampling method was employed (Vehovar et al., 2016, Zikmund, 2019). Using this technique implied that judgement was used to choose participants, who met the sampling requirements, which included SMME employees and owners (Zikmund, 2019). However, the use of non-probability sampling method prevents the generalisation of these results to a wider population (Vehovar et al., 2016).

4.10. Conclusion

Chapter 4 discussed the research design and method. The methodology used for the descriptive and statistical analysis was described. In addition, the selection of statistical techniques for conducting hypothesis testing was discussed. Finally, the limitations of the study were presented. The results of the descriptive and statistical analyses, as well as the hypotheses, are presented in Chapter 5.

CHAPTER 5 RESEARCH FINDINGS

5.1 Introduction

Entrepreneurial orientation (OE) is conceptualised in this research as both multidimensional and unidimensional, with the interest to understand its relationship with organisational ambidexterity (OA), as well as to examine the moderating effect of technological turbulence on the relationship between the entrepreneurial orientation and organisational ambidexterity. This was achieved by testing the hypotheses, which were developed in Chapter 3 from the conceptual model presented in Chapter 3. The results of the empirical data are presented in this chapter, starting with data screening and cleaning to ensure rigour and credibility in the results (Abdulwahab, Dahalin, & Galadima, 2011), followed by the screening and cleaning of the participants' demographic data, which show the participants' distribution then the descriptive statistics. Flowing from this is the multivariate analysis, which analyses the validity and reliability of the constructs and then the testing of the hypotheses, using the structural equation modelling partial least square (PLS-SEM). The chapter closes with the summary of the results.

5.2 Data Preparation

The empirical data comprised 181 responses. However, there were 15 responses that confirmed that their organisations were not established in South Africa. Therefore, they were excluded in the analysis, as the study focused on South Africa and foreign companies might influence the data on local entrepreneurial orientation. This resulted in 166 responses used for the data analysis. The extreme outliers were assessed using Z-scores and few were discovered in few variables and were treated with deletion technique (Mowbray et. al., 2019), as these observations are regarded as significantly different to the rest of the observations (Tabachnick & Fidel, 2013). The missing value analysis was also conducted and there were no issues with missing values, with all variables having a missing value of less than 5% (Scheffer, 2002; Abdulwahab et. al., 2011). The variables were then assessed for CMB, using Harman's single factor test, and the results showed that there were no CMB, as the extracted cumulated values represented less than 50%, at a level of 36.65%.

5.3 Profile of the Participants

Four variables provided the distribution profile of the participants in this study, which were participants' role in the enterprise, the industry of the participant, enterprise classification and the number of employees in the enterprise (Table 6). The profile shows that 31.9% of the participants are managers in these enterprises, while 54.8% are either owners, shareholders or directors, with the remainder (13.3%) holding different roles such as finance, sales, research, training or facilitation or human resources. The SMMEs are active in different industries, with 21.7% in

finance and business services, 16.3% in communication, social and personal service and 10.8% in engineering, transport and construction. The participants from marketing, advertising and media, electricity, gas, and water, manufacturing, property, accommodation, catering and tourism as well as ICT and other technologies represent between 4.82% and 7.23% each. The remaining 21.1% represent participants from other industries, such as education, entertainment, arts and crafts, architecture, and general suppliers, among others.

Table 6 Profile of the participants

Profile variable		**Frequency (n)**	**Percent frequency (%)**
Role in the enterprise	Manager	53	31.9
	Owner or shareholder	50	30.1
	Director	41	24.7
	Others	22	13.3
Industry	Finance and business services	36	21.7
	Communication, social and personal services	27	16.3
	Engineering, transport and construction	18	10.8
	Marketing, advertising and media	12	7.23
	Electricity, gas, water	11	6.63
	Manufacturing	11	6.63
	Property, accommodation, catering and tourism	8	4.82
	ICT and other technologies	8	4.82
	Others	35	21.1
Enterprise classification	Medium	79	47.6
	Micro	33	19.9
	Small	54	32.5
Number of employees	10 or less	73	44.0
	11- 50	28	16.9
	51 – 250	36	21.7

	More than 250	29	17.5

Almost half of the participants (47.6%) are from medium-sized enterprises, 32.5% from small enterprises and 19.9% from micro enterprises. Within these, 44.0% are part of enterprises that have 10 or less employees, while 21.7% have 51 – 250 employees and 17.5% have more than 250 employees.

5.4. Descriptive Statistics

The study comprises 41 variables, which stem from the 5-point Likert scale in the study and relate to entrepreneurial orientation, organisational ambidexterity and technological turbulence.

5.4.1. Descriptive statistics for entrepreneurial orientation

Table 7 presents the descriptive statistics of the 23 variables of entrepreneurial orientation. The five statements the participants mostly agree with all have a mean value of more than 4.0, meaning they are within the 'agree' to 'strongly agree' zone. The statement the participants mainly agree with is 'Our business seeks new ways of doing things' (OE3) within mean, M = 4.27 (SD = 0.77) with median, Md = 4.00. This is followed by two statements with similar means, M = 4.13, which states 'We actively introduce improvements and innovations in our business' (OE1) and 'Our organisation seeks to discover unmet customer needs' (OE12). The other statement the participants mostly agree with is 'Our organisation seeks innovative ways to co-create added value with customers' (EO7) (M = 4.10, SD = 0.909, Md = 4.00), 'Our business is creative in its methods of operation' (EO7) (M = 4.07, SD = 0.843, Md = 4.00) and 'Our organisation monitors trends to understand what users will need in the future' (EO14) (M = 4.07, SD = 0.855, Md = 4.00).

The statements the SMMEs agree with the least is 'Our organisation innovates even at the risk of making our own products obsolete' (EO13) (M = 3.13, SD = 1.124, Md = 3.00), 'Changes in our product lines have usually been quite dramatic' (EO6) (M = 3.25, 1.104, Md = 3.00) and 'We are very often the first business to introduce new products' (M = 3.26, SD = 1.144, Md = 3.00). The skewness and kurtosis provide information of spread and on the normality distribution of the data. The results show that all the variables are normally or near normally distributed with the values, with the guidelines of ±1.96 (Hair Jr. et al., 2019; Watkins, 2018).

Table 7 Descriptive statistics of entrepreneurial orientation

Variables		Mean (M)	Median (Md)	Std. Deviation (SD)	Skewness	Kurtosis
We actively introduce improvements and innovations in our business	EO1	4.13	4.00	0.871	-1.154	1.544
Our business is creative in its methods of operation	EO2	4.07	4.00	0.843	-1.123	1.459
Our business seeks new ways of doing things	EO3	4.27	4.00	0.770	-1.169	1.556
We favour a strong emphasis on R&D, technological leadership, and innovation	EO4	3.90	4.00	0.951	-0.718	-0.102
My firm has marketed many new lines of products in the past 3 years	EO5	3.68	4.00	1.018	-0.583	-0.513
Changes in our product lines have usually been quite dramatic	EO6	3.25	3.00	1.104	-0.123	-1.033
Our organisation seeks innovative ways to co-create added value with customers	EO7	4.10	4.00	0.909	-0.976	0.331
Our organisation experiments with innovative market approaches	EO8	4.04	4.00	0.840	-0.943	0.704
Our organisation collaboratively creates value with distributors in innovative ways	EO9	3.82	4.00	0.926	-0.610	-0.360
We initiate actions to which competitors respond	EO10	3.62	4.00	1.008	-0.598	-0.239
We are very often the first business to introduce new products, administrative techniques, operating technologies, etc.	EO11	3.26	3.00	1.144	-0.130	-0.925
Our organisation seeks to discover unmet customer needs	EO12	4.13	4.00	0.840	-0.989	0.738

Our organisation develops solutions to address unstated customer needs	EO13	3.94	4.00	0.935	-0.739	-0.201
Our organisation innovates even at the risk of making our own products obsolete	EO14	3.13	3.00	1.124	0.073	-1.060
Our organisation monitors trends to understand what users will need in the future	EO15	4.07	4.00	0.855	-0.976	0.673
We excel at identifying opportunities	EO16	4.01	4.00	0.924	-0.758	-0.169
We initiate actions to which other organisations respond	EO17	3.68	4.00	1.012	-0.534	-0.523
We have a strong propensity for high-risk projects (with chances of very high returns)	EO18	3.44	4.00	1.095	-0.259	-0.954
We believe, owing to the nature of our business environment, that bold, wide-ranging acts are necessary to achieve the firm's objectives	EO19	3.83	4.00	0.899	-0.674	0.078
When there is uncertainty, we typically adopt an aggressive posture so that we maximise the probability of exploiting potential opportunities	EO20	3.59	4.00	0.897	-0.524	-0.324
The term 'risk taker' is considered a positive attribute for people in our business	EO21	3.79	4.00	1.006	-0.707	-0.240
People in our business are encouraged to take calculated risks with new ideas	EO22	3.90	4.00	0.942	-0.862	0.188
Our business emphasises both exploration and experimentation for opportunities	EO23	4.03	4.00	0.877	-0.933	0.461

5.4.2 Descriptive statistics for organisational ambidexterity

There are 14 variables for organisational ambidexterity (Table 8). The statements the participants mostly agree with is 'Lowering costs of internal processes is an important objective' with mean, M = 4.30, SD = 0.718, followed by the statement 'Our organisation expands services for existing clients' (EO13) (M = 4.12, SD = 0.774, Md = 4.00). The remainder of the statements are about 3.4 or higher, indicating that the participants generally agree with the statements, all with a median, Md = 4.00. The data is normally distributed, with skewness and kurtosis values all within ±1.96 (Hair Jr. et al., 2019; Watkins, 2018).

Table 8 Descriptive statistics of the entrepreneurial orientation

Variables		Mean (M)	Median (Md)	Std. Deviation (SD)	Skewness	Kurtosis
Our firm accepts demands that go beyond existing products and services	OA1	3.88	4.00	0.909	-1.087	1.403
We invent new products and services	OA2	3.70	4.00	1.083	-0.695	-0.329
We experiment with new products and services in our local market	OA3	3.92	4.00	0.996	-1.064	0.738
We commercialise products and services that are completely new to our firm	OA4	3.70	4.00	1.079	-0.757	-0.156
We frequently utilise new opportunities in new markets	OA5	3.78	4.00	0.934	-0.600	-0.213
Our firm regularly uses new distribution channels	OA6	3.44	4.00	1.131	-0.285	-0.901
We regularly search for and approach new clients in new markets	OA7	4.07	4.00	0.828	-0.865	0.532
We improve our provision's efficiency of products and services	OA8	4.05	4.00	0.766	-0.581	0.178

We introduce improved, but existing products and services for our local market	OA9	4.14	4.00	0.781	-0.893	0.830
We regularly implement small adaptations to existing products and services	OA10	4.06	4.00	0.844	-0.928	0.622
We frequently refine the provision of existing products and services	OA11	4.09	4.00	0.759	-0.836	0.940
We increase the economies of scale in existing markets	OA12	3.78	4.00	0.924	-0.864	0.574
Our organisation expands services for existing clients	OA13	4.12	4.00	0.774	-1.019	1.356
Lowering costs of internal processes is an important objective	OA14	4.30	4.00	0.718	-0.811	0.444

5.4.3 Descriptive statistics for technological turbulence

Four variables highlight the technological turbulence for the SMMEs, with the participants mainly agreeing with the statement 'I believe that technological developments in our industry are fairly major' (TT1) (M = 4.25, SD = 0,793, Md = 4.00) and least agree with the statement 'It is difficult to forecast technology developments in our industry' (TT4), (M = 3.22, Sd = 1.188, Md = 3.00) (Table 9).

Table 9 Descriptive statistics for technological turbulence

Variables		Mean	Median	Std. Deviation	Skewness	Kurtosis
I believe that technological developments in our industry are fairly major	TT1	4.25	4.00	0.793	-1.092	1.126
New product ideas have been made possible through technological breakthroughs in my firm	TT2	3.96	4.00	1.002	-0.845	0.029
New customers have product needs that are different from our existing customers in my firm	TT3	3.70	4.00	1.065	-0.568	-0.693
It is difficult to forecast technology developments in our industry	TT4	3.22	3.00	1.188	-0.034	-1.180

5.5 Multivariate Analysis

The multivariate analysis analysed the validity and reliability of the constructs, using the exploratory factor analysis and reliability as well as confirmatory factor analysis, which was conducted, using structural equation modelling partial least square (PLS-SEM).

5.5.1 Validity and reliability of the entrepreneurial orientation

The exploratory factor analysis was analysed, using principal components analysis with varimax rotation. Initially, the suitability of the factor analysis was done, using Kaiser Meyer-Olkin (KMO) and Bartlett's test for sphericity (Table 9). The suitability of the factor analysis was confirmed with KMO = 0.925 as it was higher than 0.6, and with the Bartlett's test being statistically significant, χ^2 (253) = 1812.6, p <.001 (Watkins, 2018).

The 23 variables yield three factors, component 1 is innovativeness, with percent of variance extracted being 42.75% and the Eigen value of 9.833. The second component is risk-taking with seven items and a variance extracted being 7.650 and Eigen value of 1.759. The last construct is proactiveness with six items, which also have an Eigen value that is higher than 1.0. All three construct are reliable with Cronbach's alpha, with innovativeness, risk-taking and proactiveness being α = 0.901, α = 0.875 and α = 0.824, respectively, as per George and Mallery (2003).

Table 10: Exploratory factor analysis of entrepreneurial orientation

	Component					
Variable	**1**	**2**	**3**	**Variance extracted**	**Eigen value**	**α**
EO15	0.744	0.255	0.199			
EO7	0.731	0.169	0.177			
EO2	0.716	0.115	0.290			
EO8	0.707	0.137	0.355			
EO12	0.702	0.303	0.115			
EO3	0.634	0.230	0.196	42.75	9.833	0.911
EO4	0.629	0.094	0.409			
EO1	0.602	0.225	0.287			
EO9	0.557	0.186	0.444			
EO13	0.555	0.361	0.247			
EO20	-0.041	0.757	0.231			
EO21	0.355	0.721	0.028			
EO22	0.334	0.700	-0.044			
EO19	0.261	0.663	0.175	7.650	1.759	0.873
EO18	0.049	0.600	0.489			
EO16	0.411	0.523	0.312			
EO23	0.475	0.521	0.234			
EO11	0.221	0.103	0.756			
EO17	0.318	0.339	0.667			
EO10	0.375	0.031	0.611	5.811	1.336	0.825
EO5	0.190	0.088	0.583			
EO6	0.294	0.307	0.531			
EO14	0.261	0.427	0.460			

Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO = 0.925)

Bartlett's Test of Sphericity = χ^2 = 1812.6, *df* = 253, $p < .001$

These multidimensional constructs of entrepreneurial orientation were assessed for convergence validity, composite reliability and discriminant validity. The measurement model for the confirmatory factor analysis is presented in Figure 3. All the loading factors are higher than 0.6 with the average per construct 0.7 or higher.

An assessment was conducted to determine if the relationship between the indicator variables and the latent constructs were formative or reflective. This highlights whether the indicators are affected by the latent constructs (reflective), or indicators define the latent constructs (formative) (Coltman et al., 2008). A confirmatory tetrad analysis confirms that the measurement model is best measured reflectively, as more than 80% in all three constructs of entrepreneurial orientation are non-significant ($p > 0.05$). The model has a good fit with SRMR = 0.073, which is better than the threshold of 0.08 (SRMR ≤ 0.080) (Henseler et al., 2014).

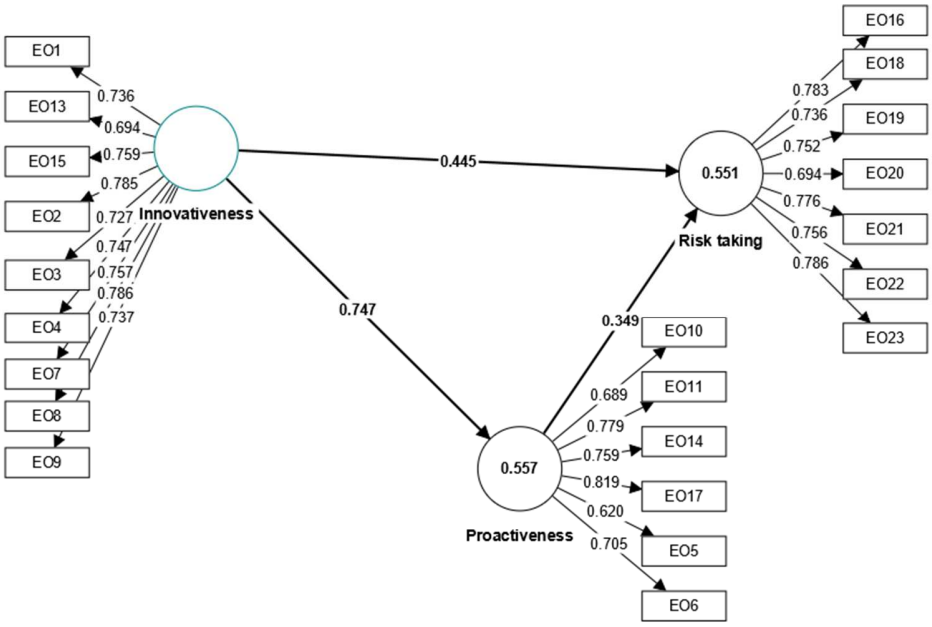

Figure 3 Measurement model of the entrepreneurial orientation

Table 11 below presents the convergence validity with AVE with a value higher than the minimum threshold of 0.5, where innovativeness has AVE = 0.560, risk-taking, AVE = 0.571 and proactiveness, AVE = 0.535. The reliability for all the constructs is good, based on the composite reliability (rho_c), composite reliability (rho_a), and Cronbach's alpha with all values higher than 0.7.

Table 11 Convergence validity and reliability test

Constructs	Cronbach's alpha	Composite reliability (rho_a)	Composite reliability (rho_c)	Average variance extracted (AVE)
Innovativeness	0.901	0.901	0.920	0.560
Proactiveness	0.824	0.836	0.873	0.535
Risk-taking	0.875	0.883	0.903	0.571

Fornell-Larcker criterion and Heterotrait-monotrait ratio (HTMT) – Matrix were used to test the discriminant validity and both these tests confirm the discriminant validity, with the highest loading for its own construct for the Fornell-Larcker criterion and all values for the Heterotrait-monotrait ratio (HTMT) – Matrix, less than the threshold of 0.85 (Kline, 2011).

Table 12 Discriminant validity and reliability test

Fornell-Larcker criterion	Innovativeness	Proactiveness	Risk-taking
Innovativeness	0.748		
Proactiveness	0.747	0.731	
Risk-taking	0.705	0.681	0.755
Heterotrait-monotrait ratio (HTMT) - Matrix	**Innovativeness**	**Proactiveness**	**Risk-taking**
Innovativeness			
Proactiveness	0.862		
Risk-taking	0.775	0.776	

5.5.2 Validity and reliability of the organisational ambidexterity

The exploratory factor analysis was also conducted for organisational ambidexterity, and post confirmation of suitability with (KMO = 0.911) and Bartlett's Test of Sphericity = χ^2 = 1068.6, *df* = 91, $p < .001$, which yields two factors named exploratory innovation with five items and exploitative innovation with nine items (Table 13).

Table 13 Exploratory factor analysis of organisational ambidexterity

	Component				
Variables	**1**	**2**	**Variance extracted**	**Eigen value**	**α**
OA3	0.813	0.224			
OA4	0.789	0.189			
OA2	0.733	0.282	47.12	6.596	0.88
OA5	0.715	0.301			
OA1	0.714	0.123			
OA11	0.230	0.832			
OA10	0.139	0.797			
OA8	0.414	0.664			
OA14	0.055	0.663			
OA13	0.386	0.623	9.791	1.371	0.868
OA7	0.408	0.577			
OA9	0.539	0.546			
OA12	0.466	0.480			
OA6	0.388	0.421			
Overall					0.909

Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO = 0.911)

Bartlett's Test of Sphericity = χ^2 = 1068.6, *df* = 91, *p* <.001

The confirmatory factor analysis was conducted with measurement model presented in Figure 4 on the next page, which shows a good fit with SRMR = 0.074 (Henseler et al., 2014).

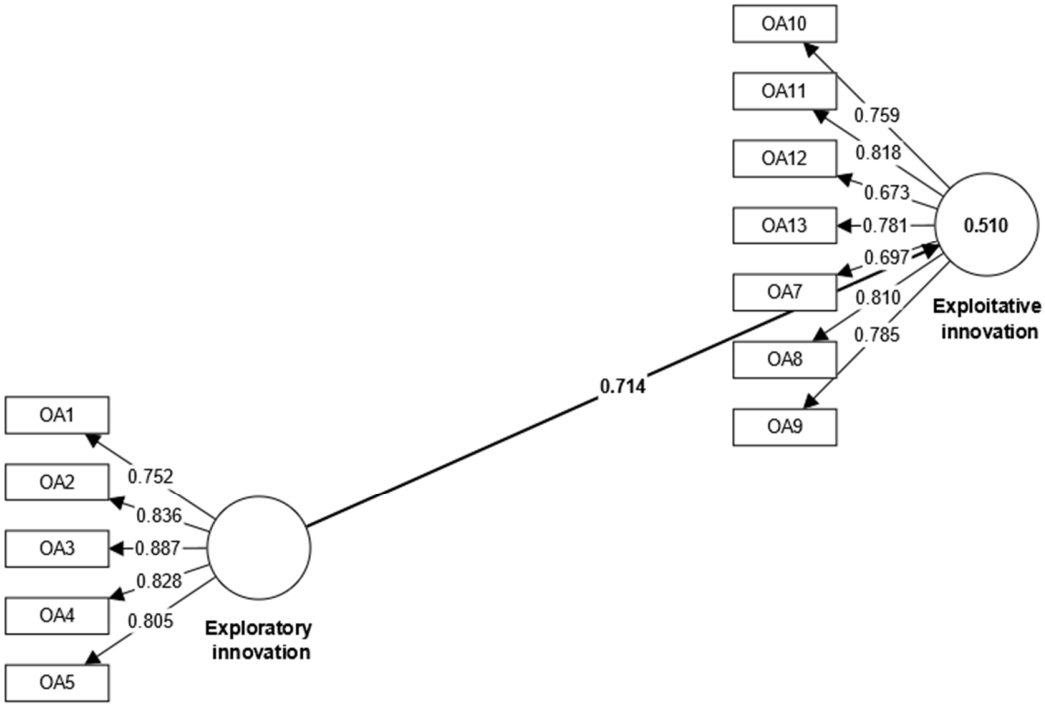

Figure 4 Measurement model of organisational ambidexterity

Average variance extracted is 0.581 for exploitative innovation and 0.677 for exploratory innovation, confirming the convergence validity. The reliability is good for both constructs, with composite reliability (rho_c), composite reliability (rho_a) and Cronbach's alpha values higher than 0.7 (Table 14).

Table 14 Convergence validity and reliability test for organisational ambidexterity

Constructs	Cronbach's alpha	Composite reliability (rho_a)	Composite reliability (rho_c)	Average variance extracted (AVE)
Exploitative innovation	0.879	0.882	0.906	0.581
Exploratory innovation	0.880	0.885	0.913	0.677

5.4.3 Validity and reliability for technological turbulence

Technology turbulence has four variables and an exploratory factor analysis confirms that there is only one construct, with the reliability of the constructs being 0.606 after excluding TT4.

5.5 Correlation Matrix

The correlation matrix was conducted to understand the correlation of all six constructs and their results, which were assessed for statistical significance at 95% ($p < .05$) and 99% ($p < .01$), where the direction is either positive or negative and the strength as per guidelines of Pallant (2010), where $0.09 \leq r \leq 0.29$ (weak), $0.30 \leq r \leq 0.49$ (medium) and $r \geq 0.50$ (strong) (Table 14 below). The results show that there is a statistically significant strong positive correlation between proactiveness and exploratory innovation ($r = 0.741$, $p < .01$). The results also show statistically significant and strong positive correlation between innovativeness and exploratory innovation ($r = 0.705$, $p < .01$) and between risk-taking and exploratory innovation ($r = 0.693$, $p < .01$). The results also show a statistically significant positive relationship between the unidimensional perspective of entrepreneurial orientation (innovativeness, risk-taking and proactiveness) and exploitative innovation. Technological turbulence has a statistically significant positive relationship with exploratory innovation ($r = 0.575$, $p < .01$) and medium strength with exploitative innovation ($r = 0.47$, $p < .01$). Technological turbulence has a statistically significant correlation with all three entrepreneurial orientation constructs (innovativeness, risk-taking and proactiveness) with medium or full strength.

Table 15 Correlation matrix of the constructs

	1	2	3	4	5	6
1. Exploratory innovation	-					
2. Exploitative innovation	.694**	-				
3. Innovativeness	.705**	.758**	-			
4. Risk-taking	.693**	.623**	.726**	-		
5. Proactiveness	.741**	.650**	.742**	.657**	-	
6. Technological turbulence	.575**	.470**	.500**	.459**	.588**	-

**. Correlation is significant at the 0.01 level (2-tailed).

5.6 Structural Model and Hypotheses Testing

5.6.1 Relationship between entrepreneurial orientation and organisational ambidexterity

The structural model was used to test Hypothesis 1, which states that there is a positive relationship between entrepreneurial orientation and organisational ambidexterity. The Hypothesis 1 is:

H1: There is a positive relationship between entrepreneurial orientation and organisational ambidexterity

The analyses tested the quality of the prediction model. Q^2 value are above 0,which indicates a good predictive quality of the model, $Q^2 = 0.600$ for exploitative innovation and $Q^2 = 0.609$ for exploratory innovation (Table 16).

Table 16 Predictive quality of model

Constructs	Q^2predict
Exploitative innovation	0.600
Exploratory innovation	0.609

Figure 5 presents the structural model of the relationship between entrepreneurial orientation as a unidimensional construct and organisational ambidexterity. The results indicate that entrepreneurial orientation has a statistically significant positive relationship with the organisational ambidexterity construct exploratory innovation (β = 0.789, p < 001) and it also has a statistically significant positive relationship with the organisational ambidexterity construct with exploitative innovation (β = 0.783, p < 001).

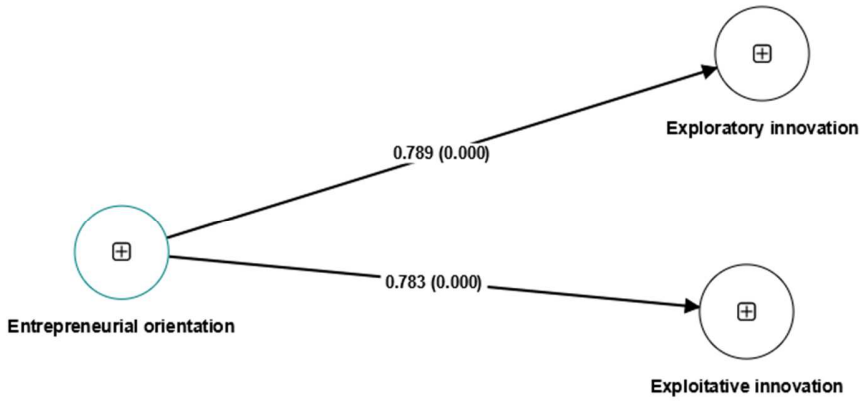

Figure 5: Structural model for entrepreneurial orientation and organisational ambidexterity

To test the relationship for entrepreneurial orientation as a multidimensional construct, three sub-hypotheses were tested:

H1a: There is a positive relationship between risk-taking and organisational ambidexterity

H1b: There is a positive relationship between proactiveness and organisational ambidexterity

H1c: There is a positive relationship between innovativeness and organisational ambidexterity.

The structural models were used to test the hypotheses, but before this was done, a predictive analysis was done to determine if the model has good predictive quality (Table 16). All Q^2 value are above 0, which indicates a good predictive quality of the model. This is confirmed by the linear model (LM_RMSE), which has higher values than the error (PLS-SEM_RMSE) and fit (PLS SEM_MAE) values. Both the Q2 > 0 for exploitative innovation and exploratory innovation confirm the good predictive quality of the model.

Table 17 Prediction of quality of model

Variable	Q^2predict	PLS-SEM_RMSE	PLS-SEM_MAE	LM_RMSE	LM_MAE
OA10	0.235	0.736	0.556	0.797	0.606
OA11	0.369	0.599	0.469	0.639	0.494
OA12	0.288	0.780	0.589	0.853	0.661
OA13	0.351	0.622	0.473	0.667	0.509
OA7	0.389	0.643	0.509	0.676	0.516
OA8	0.378	0.602	0.470	0.642	0.508
OA9	0.308	0.642	0.486	0.684	0.521
OA1	0.315	0.753	0.561	0.767	0.593
OA2	0.439	0.812	0.619	0.850	0.645
OA3	0.440	0.746	0.545	0.820	0.592
OA4	0.366	0.859	0.642	1.010	0.751
OA5	0.482	0.669	0.499	0.756	0.550
Construct	**Q^2predict**	**RMSE**	**MAE**		
Exploitative innovation	0.587	0.653	0.511		
Exploratory innovation	0.610	0.637	0.460		

The structural model for the multidimensional entrepreneurial orientation – innovativeness, risk-taking and proactiveness with the organisational ambidexterity – exploitative innovation and exploratory innovation is presented in Figure 6.

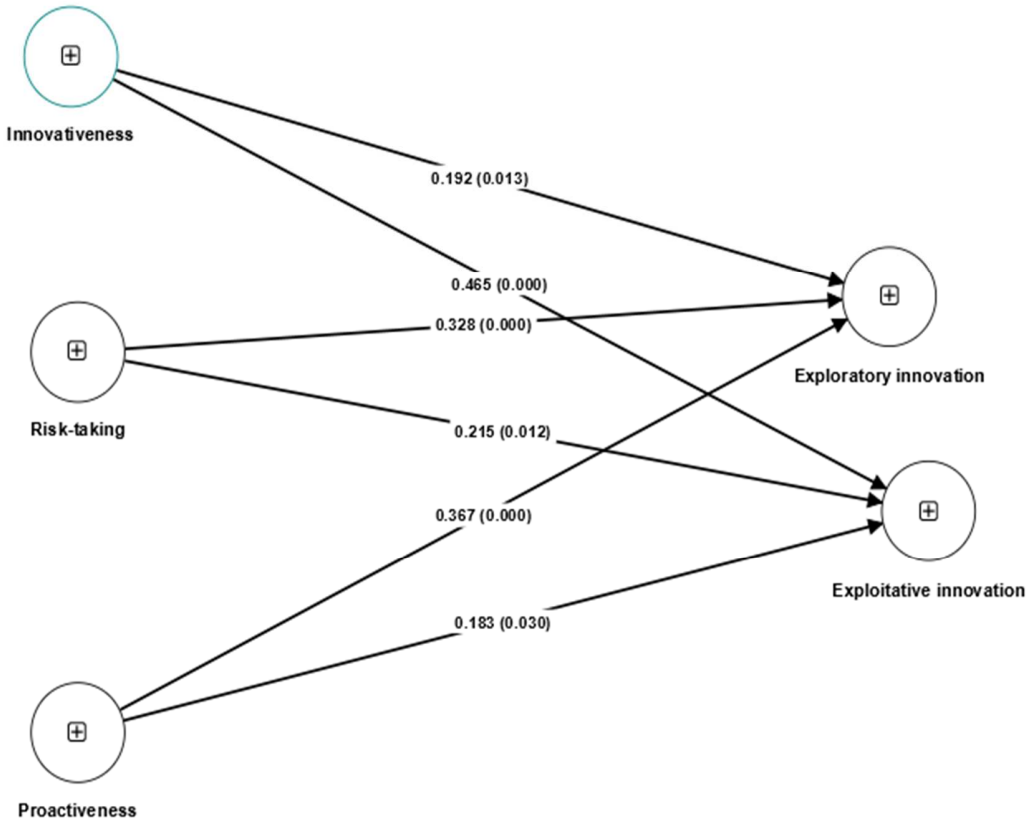

Figure 6 Structural model of unidimensional constructs of entrepreneurial orientation and organisational ambidexterity constructs

The path innovativeness -> exploitative innovation iwas statistically significant, indicating that there is a positive relationship between risk-taking and organisational ambidexterity ($\beta = 0.465$, $p < .001$), and also the other path, being innovativeness -> exploratory innovation ($\beta = 0.192$, $p < .001$). Both the paths for risk-taking; risk-taking -> exploitative innovation ($\beta = 0.215$, $p < .012$ and risk-taking -> exploratory innovation ($\beta = 0.328$, $p < .001$) are statistically significant, confirming that there is a positive relationship between risk-taking and organisational ambidexterity. The results also show that there is a positive relationship between proactiveness and organisational ambidexterity. These relationships had a substantial $R^2 > 0.60$ (60%), where innovativeness -> exploitative innovation is 61.6% and innovativeness -> exploratory innovation is 63.6%. These results confirm Hypothesis 1a that there is a positive relationship between risk-taking and organisational ambidexterity. The results also confirm Hypotheses 1b and 1c.

The second hypothesis is:

H2: Technological turbulence strengthens the relationship between entrepreneurial orientation and organisational ambidexterity

To test this hypothesis, the moderating effect of the technological turbulence was tested on the relationship of entrepreneurial orientation (unidimensional and multidimensional) and the organisational organisational ambidexterity constructs. The results show that the technology turbulence has a statically significant relationship with exploratory innovation ($\beta = 0.176$, $p < .01$). However, there is no statistically significant relationship between the technology turbulence and exploitative innovation, with the p-value higher than 5% ($p = 0.294$). Technology does not exhibit any moderating effect with all the moderating paths not statistically significant (Figure 7).

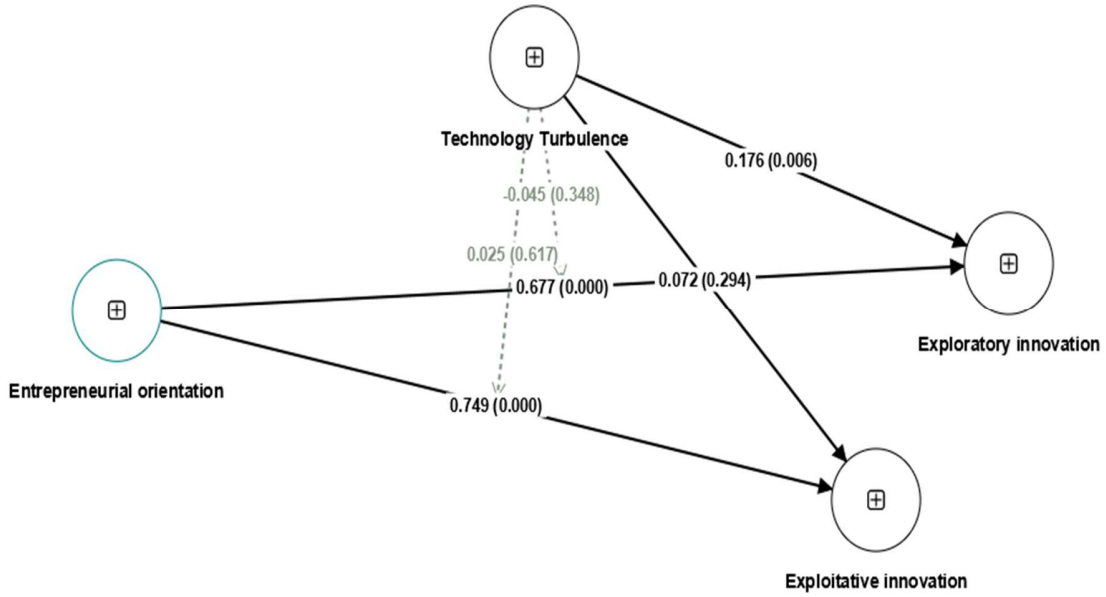

Figure 7 Structural model for moderation effect on the relationship between entrepreneurial orientation and organisational ambidexterity constructs

The results confirm that Hypothesis 2 is not supported. The moderating effect was also tested with the multidimensional entrepreneurial orientation (innovativeness, risk-taking and proactiveness), as per Hypotheses 2a to 2c:

H2a: Technological turbulence strengthens the relationship between risk-taking and organisational ambidexterity

H2b: Technological turbulence strengthens the relationship between proactiveness and organisational ambidexterity

H2c: Technological turbulence strengthens the relationship between innovativeness and organisational ambidexterity

The results confirm the unidimensional construct of the entrepreneurial orientation on the moderation effect of the technology turbulence.

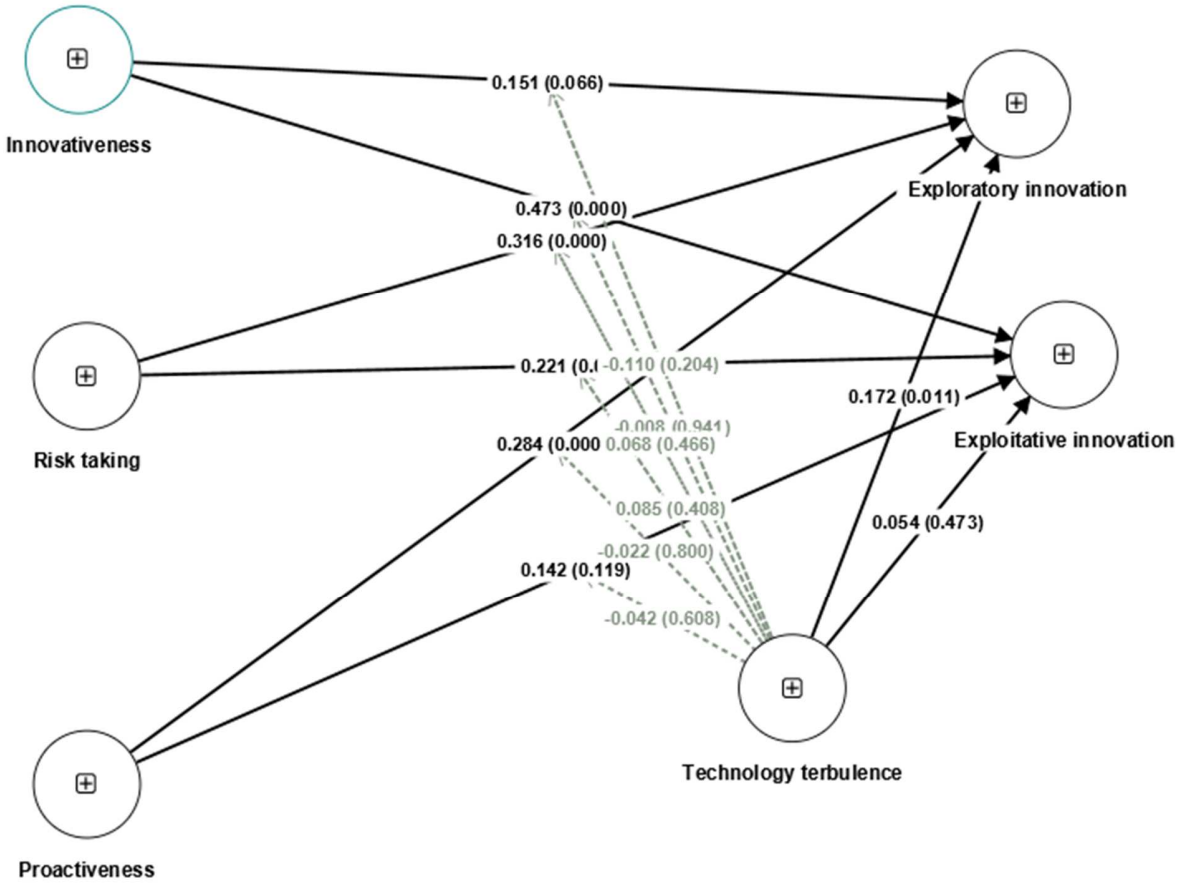

Figure 8 Structural model for the moderation effect on the relationship between entrepreneurial orientation and organisational ambidexterity constructs

These results confirm that Hypotheses 2a, 2b and 2c are also not supported by the findings in the study.

5.7 Summary and Conclusion

The empirical data was collected from the SMMEs with 166 SMMEs used for data analysis. The results show that the entrepreneurial orientation as a unidimensional construct and multidimensional constructs (innovativeness, risk-taking and proactiveness) have a statically significant relationship with organisational organisational ambidexterity. However, technological

turbulence does not seem to have a statistically significant moderation effect on the relationship between entrepreneurial orientation or its constructs and organisational ambidexterity. These results are discussed in more detail in Chapter 6, and the limitations of the study are provided in Chapter 7 so as to contextualise the findings.

Table 18 Summary of results

Enterprise Classification		**Percent Frequency (%)**
Medium enterprise		47.6%
Small enterprise		32.5%
Micro enterprise		19.9%
Section	**Sub-Section**	**Results Summary**
Data Screening and Cleaning for Quality Analysis	Data Collection	The final sample size was decreased to 166 participants after participants who did not fit the requirements were excluded from the original sample size of 181 participants. Missing values were below 5% and considered acceptable. The dataset had no common method bias detected.
Multivariate Analysis	Normality	The dataset was shown to be normally or nearly normally distributed by the results of the tests for skewness and kurtosis and was deemed acceptable.
	Outliers	
	Validity	CFA was used to confirm the convergent and discriminant validity, and the outcomes were deemed satisfactory.
	Reliability	The reliability of constructs was tested through composite reliability (rho_a), composite reliability (rho_c) and Cronbach's alpha. Reliability values were deemed acceptable.
	Structural Model Assessment	The structural model was measured through SRMR, and it was confirmed as a good fit.

	Dimension Reduction	Factorised variables were confirmed to be in the excellent range by using the KMO and Bartlett's Test of Sphericity.
Descriptive Statistics	Demographics	
	Control Variables	
Hypotheses Testing	H1	Entrepreneurial orientation (unidimensional) was found to positively correlate with organisational ambidexterity, and it was also found to be a predictor of organisational ambidexterity.
	H1a	Risk-taking was found to positively correlate with organisational ambidexterity, and it was found to be a predictor of organisational ambidexterity.
	H1b	Proactiveness was found to positively correlate with organisational ambidexterity, and it was found to be a predictor of organisational ambidexterity.
	H1c	Innovativeness was found to positively correlate with organisational ambidexterity, and it was found to be a predictor of organisational ambidexterity.
	H2	Technological turbulence did not exhibit any moderating effect on entrepreneurial orientation (unidimensional and multidimensional) and organisational ambidexterity. However, technological turbulence had a positive correlation with exploratory innovation, but no significant relationship with exploitative innovation.
	H2a, H2b, and H2c	The findings demonstrated that hypotheses H2a, H2b, and H2c are not supported in the study.

CHAPTER 6 – DISCUSSION OF THE RESULTS

6.1. Introduction

The discussion of the findings from statistical analysis and the descriptive statistics is outlined in this chapter. It concludes by discussing the findings of the hypotheses that were tested, as well as additional insights that emerged from this study.

6.2. Data Collection

The size of the sample comprised 166 participants, which means that it was within the 100 and 200 recommended sample range for the use of PLS-SEM (Hair et al., 2019; Hair Jr. et al., 2019). The sample size was deemed appropriate for descriptive statistics and multivariate analysis, since it fell within the range of similar research studies on entrepreneurial orientation, for instance, Basco et al. (2020) used a sample of 114 in China, 102 in Mexico, and 114 in Spain. These results, however, cannot be extrapolated or generalised to a broader population, because of the lack of a sample frame at the beginning of the data collection phase (Vehovar et al., 2016).

6.3. Multivariate Analysis

The test for skewness and kurtosis demonstrated that the dataset was normally distributed for entrepreneurial orientation (Hair Jr. et al., 2019; Watkins, 2018). On entrepreneurial orientation and organisational ambidexterity, the exploratory factor analysis' appropriateness was validated with KMO and Bartlett's test for sphericity (Watkins, 2018). A confirmatory tetrad analysis demonstrated that the entrepreneurial orientation model was best measured reflectively. This confirmed Covin and Wales' (2019) argument that the latent construct of entrepreneurial orientation exists independent of the measured item (Coltman et al., 2008). Therefore, adding or dropping an item does not change the conceptual domain of the construct, and the variation in the construct causes a variation in the items measured (Coltman et al., 2008; Covin & Wales, 2019).

While Anderson et al.'s (2015) reconceptualisation of entrepreneurial orientation is well argued, it is not conceptually necessary to separate management risk-taking behaviour from the dimensions of entrepreneurial orientation (Covin & Wales, 2019). However, as recommended by Anderson et al. (2015), academics are at liberty to embrace the attitude indicators of entrepreneurial orientation in addition to its behavioural indicators (Covin & Wales, 2019). The adoption of entrepreneurial concepts and their conceptualisation, however, is what is most crucial (Covin & Wales, 2019). Therefore, as argued by Covin and Wales (2019), academics must be consistent with the widely accepted view that entrepreneurial orientation is an "organisational attribute reflecting what it means to be entrepreneurial" (p. 8).

Construct reliability was established, this demonstrated that the measure of all constructs was consistent, dependable, and within good fit (Hair et al., 2021; Hair Jr. et al., 2019). Given that the Cronbach's alpha is conservative, and the composite reliability is liberal, the true value of construct reliability lies between the Cronbach's alpha and composite reliability (Hair et al., 2021). Both Cronbach's alpha and composite reliability scores were above 0.7; therefore, this demonstrated that multiple item construct measurement would yield internal consistency in the study (Hair et al., 2021). As such, the measurements of this study sufficiently represented the underlying constructs it was designed to measure.

Content validity was established, therefore, the indicators seemed to be reasonable measures of the underlying constructs (Hair Jr. et al., 2019). Convergent validities were established, all constructs had AVEs that were higher than 0.50, indicating that the constructs account for most of the variance in the variables they measured (Hair Jr. et al., 2019). Additionally, discriminant validity demonstrated the constructs' uniqueness and established that they reflected a phenomenon that was not captured by other constructs in the model (Hair Jr. et al., 2019). These findings on reliability and validity showed that the currently existing scales, despite being created in distinct contexts, are valid and reliable in the setting of this research study (Bonett & Wright, 2015).

6.4. Descriptive Statistics

6.4.1 Population demographics

Four variables from the survey were analysed to comprehend the distribution profile of the participants. These included role in the enterprise, enterprise classification, number of employees, and industry. The profile of the participants revealed that 31.9% held management positions in these firms, while 54.8% were owners, shareholders, or directors. The remaining 13.3% held positions in finance, sales, research, training or facilitation, or human resources. One can therefore conclude that most of the participants were owners, shareholders, or directors. Given that entrepreneurial orientation takes diverse forms at various organisational levels, this could have been a source of bias, albeit it was not significant for the study (Covin et al., 2020; Covin & Wales, 2019). For instance, it might appear at the upper levels of an organisation as market-driven innovation, while the middle levels are more customer-focused on product innovation, and the lower levels possess an internally-driven innovation (Covin et al., 2020).

There were other industries represented at a much lower incidence, and these included education, entertainment, arts and crafts, architecture, and general suppliers who were in the minority. One can conclude that most participants came from finance and services (21.7%). High-tech firms

were distributed across communication, engineering, media, energy, advertising, and manufacturing industries. This could have had an impact on the moderating role of technological turbulence, because participants' perception of the rate of technological turbulence may be higher in high-tech industries, compared to low-tech industries as asserted by Slavec Gomezel, and Aleksić (2020). The five statements the participants mostly agreed with all had a mean value of more than 4.0, meaning they were within the 'agree' to 'strongly agree' zone. Therefore, a threshold mean score of 4.0 was considered acceptable.

6.5. Hypotheses Testing

6.5.1 H1: There is a positive relationship between entrepreneurial orientation and organisational ambidexterity

To gain a deeper comprehension of the organisational configuration of entrepreneurial orientation (Wales et al., 2020), the three dimensions were factorised. The KMO findings of entrepreneurial orientation were 0.925, and Bartlett's test was found to be statistically significant, χ^2 (253) = 1812.6, $p < .001$. This showed that SMMEs have an above-average propensity for being entrepreneurial. This finding supported Ferreras-Méndez et al. (2022), Bodlaj and Čater's (2019) notion that entrepreneurial orientation can act as an antecedent in influencing innovative performance and speed to market. This can be achieved through organisational ambidexterity (Ferreras-Méndez et al., 2022). On the one hand, in the approach to new product development, SMMEs can leverage on their proactiveness, innovativeness, and risk-taking to engage in exploration and launch new products ahead of the competitors (Ferreras-Méndez et al., 2022). On the other hand, they might accelerate their market access by exploiting existing knowledge and techniques (Ferreras-Méndez et al., 2022).

The results for H1 indicated that there was a positive relationship between entrepreneurial orientation and organisational ambidexterity, and it demonstrated a good predictive quality of model, $Q^2 = 0.600$ for exploitative innovation and $Q^2 = 0.609$ for exploratory innovation. This meant that entrepreneurial orientation was a predictor of organisational ambidexterity. This finding disproved Wiklund and Shepherd's (2011) assertion that entrepreneurial orientation is closer associated with exploratory innovation than with exploitation. Their contention was predicated on the basis that the dimensions of innovativeness, risk-taking, and proactiveness were more consonant with the domain of "experimentation and new product-markets than with the refinement of existing routines and product-markets" (Wiklund & Shepherd, 2011, p. 930). This view was further accentuated by Covin and Wales (2019), who expostulated that the demonstration of entrepreneurial orientation does not require the exposition of efficient and effective exploitation of

present opportunities; yet, exploration and exploitation operate in a state of organisational ambidexterity (Jansen, van den Bosch et al., 2006; Junni et al., 2013c).

In a more recent study on individual and team entrepreneurial orientation, Covin et al. (2020) postulate that entrepreneurial orientation is well-suited for coping with turbulent environments and natural internal predisposition towards rigidity and inertia. Therefore, Wiklund and Shepherd (2011), Covin and Wales' (2019) perspective that entrepreneurial orientation is more consonant with exploration than exploitation cannot hold true, because this is counterproductive to the immediate survival of SMMEs (Huang et al., 2021; Jansen, van den Bosch et al., 2006). If indeed entrepreneurial orientation were to be more consonant with exploration, it would result in a failure trap because of the experimental and self-reinforcing nature of exploratory innovation (Gupta et al., 2006; Luger et al., 2018). Consequently, this would eventually risk SMMEs to be confronted with business failure, as they would be incapacitated from effectively competing in existing product-markets, which could generate financial resources for exploratory activities (Gupta et al., 2006; Huang et al., 2021; Luger et al., 2018).

These results confirmed Rosenbusch et al. (2013), who advocated that firms need to leverage on the task environment, create new "products and services, exploring and exploiting opportunities provided by the environment" (p. 634). Entrepreneurial orientation is a critical component in this complicated environment, because it drives specific strategic choices and resource allocations that encourage opportunity exploitation and exploration (Rosenbusch et al., 2013). The results also confirmed the findings of the study performed by Lisboa et al. (2016), who delineate that the dimensions of entrepreneurial orientation facilitate the exploration and exploitation of new product-market opportunities. Therefore, the results demonstrated that entrepreneurial orientation is a predictor of organisational ambidexterity. Given the scarcity of resources and the entrepreneurial landscape in South Africa, entrepreneurial orientation enables SMMEs to effectively make strategic choices and allocate resources to activities that encourage ambidextrous activities (Lisboa et al., 2016; Rosenbusch et al., 2013).

H1a: There is a positive relationship between risk-taking and organisational ambidexterity

This hypothesis sought to investigate the correlation between risk-taking and organisational ambidexterity. There was a strong positive correlation between risk-taking and exploratory innovation ($r = 0.693$, $p < .01$), and a strong positive correlation between risk-taking and exploitative innovation ($r = 0.623$, $p < .001$). In addition, the pathway risk-taking to exploratory innovation depicted $\beta = 0.328$, $p < .001$, and pathway risk-taking to exploitative innovation depicted $\beta = 0.215$, $p < .012$. Therefore, the results demonstrated a strong positive relationship between risk-taking and organisational ambidexterity.

This finding confirmed Lisboa et al.'s (2016) and Putniņš and Sauka's (2019) conclusions that the risk-taking posture enabled firms to take bold actions and devote resources and pursue emerging opportunities in the face of uncertainty, which is the essence of being entrepreneurial. The results implied that firms' exploratory capabilities were strengthened by a strong risk-taking posture, which will then result in a high level of exploratory innovations (Lisboa et al., 2016).

The correlation matrix denoted that the firms' risk-taking posture was lower than its level of proactiveness, which was attributed to the fact that SMMEs do not adopt an aggressive posture in seizing potential opportunities associated with uncertainty; this was indicated by a mean score of 3.59, which fell within the uncertain/ not important range. Furthermore, the findings indicated a low mean score of 3.13 on innovating at the expense of cannibalising existing products. These findings confirmed Lisboa et al.'s (2016) conclusion that a low risk-taking posture is compensated by a firm's proactiveness in forward-looking behaviour, thus resulting in a significant correlation with organisational ambidexterity. A less aggressive risk-taking behaviour may also be attributed to Bodlaj and Čater's (2019) assertion that firms susceptible to innovation failures, and SMMEs do not have the resource slack to absorb failed innovations. Therefore, they are more prone to lower their risk-taking behaviour (Bodlaj & Čater, 2019) accordingly.

H1b: There is a positive relationship between proactiveness and organisational ambidexterity

The aim of this hypothesis was to test the correlation between proactiveness and organisational ambidexterity. There was a strong positive correlation between proactiveness and exploratory innovation ($r = 0.741$, $p < .01$). There was also a strong positive correlation between proactiveness and exploitative innovation ($r = 0.650$, $p < .01$). In addition, the pathway proactiveness to exploratory innovation reflected $\beta = 0.367$, $p < .0.01$, pathway proactiveness to exploitative innovation reflected $\beta = 0.183$, $p < .0.03$. The results demonstrated statistically significant p values.

Therefore, hypothesis H1b was confirmed that there is a positive relationship between proactiveness and organisational ambidexterity.

This finding confirmed Lisboa et al.'s (2016) conclusions that positioning the firm proactively paves the way for decisive action, agility in securing a competitive advantage and effectively responding to environmental turbulence. This enables firms to anticipate and respond to new value creation opportunities (Covin et al., 2020). These findings implied that SMMEs are highly proactive in exploring and exploiting product innovations, thus confirming Rosenbusch et al.'s (2013) assertion that entrepreneurial orientation enables firms to proactively seize exploratory and exploitative innovation opportunities. However, the correlation between proactiveness and exploitative innovation of $r = 0.650$, $p < .01$, compared to $r = 0.741$, $p < .01$ with exploration, denoted that SMMEs proactively engaged in exploration rather than exploitation. This was based on a mean score of 4.07, falling within the range of agree and strongly agree on the question whether SMMEs actively monitor trends to understand future opportunities. In addition, SMMEs excelled in identifying new opportunities, as this was denoted by a mean score of 4.01. Therefore, SMMEs are highly proactive, and these findings confirmed Covin et al.'s (2020) assertion that entrepreneurial orientation enables firms to sense opportunities and act in a forward-looking manner. The findings also suggested that high proactiveness is necessary, albeit not sufficient, for entrepreneurial orientation's prediction of organisational ambidexterity (Anderson et al., 2019). Firms must act proactively in their innovativeness to defend existing markets, while simultaneously creating new product-markets (Anderson et al., 2019). Therefore, the results validated Anderson et al.'s (2019) assertion.

H1c: There is a positive relationship between innovativeness and organisational ambidexterity

The purpose of this hypothesis was to investigate the correlation between innovativeness and organisational ambidexterity. The pathway innovativeness to exploratory innovation depicted $\beta = 0.192$, $p < .013$, the pathway innovativeness to exploitative innovation depicted $\beta = 0.465$, $p < .01$. These findings demonstrated both p values were statistically significant, and therefore, there was a positive relationship between innovativeness and organisational ambidexterity. The results affirmed Lisboa et al.'s (2016) conclusion that a firm's openness to novel concepts, products and services, or processes encourages it to invest in technology that will enhance its existing products and steadily develop new product-markets.

The results also confirmed Lisboa et al.' (2016) conclusion that a prerequisite for exploitative innovation, which results in product differentiation, is an innovative posture coupled with exploitative capabilities. This enables firms to effectively compete in existing product-markets. The results also depicted a significant $R^2 = 0.616$ for exploitative innovation and substantial $R^2 = 0.636$ for explorative innovation. This meant that 61.6% of the variability was explained by the firms' innovativeness on exploitative innovation, whereas 63.6% variability was explained by the firms' innovativeness on exploratory innovation. This implied that innovativeness is a necessary condition for organisational ambidexterity, albeit not sufficient. In addition, when the level of innovativeness increases, exploitative and explorative innovations increase correspondingly.

In summary, the results disproved the common belief that an exploratory innovation is the only one that can benefit from an entrepreneurial orientation (Covin & Wales, 2019; Wiklund & Shepherd, 2011). However, taken collectively, the results demonstrated that a stimulating environment for exploratory and exploitative innovation of new products-markets is provided by all three dimensions of entrepreneurial orientation (Lisboa et al., 2016; Rosenbusch et al., 2013). The results also confirmed that firms that adopt innovativeness, proactiveness, and a risk-taking posture or a combination of innovativeness and risk-taking "can also develop incremental innovation" associated with exploitation (Lisboa et al., 2016, p. 1322).

6.5.2 H2: Technological turbulence strengthens the relationship between entrepreneurial orientation and organisational ambidexterity

The results indicated that technological turbulence had no statistically significant effect ($\beta = 0.025$, $p = 0.617$) on the pathway entrepreneurial orientation to exploitative innovation. There was also no statistically significant effect ($\beta = -0.045$, $p = 0.348$) on the moderating role of technological turbulence on entrepreneurial orientation and organisational ambidexterity. Therefore, the conclusion was that H2 was not supported, as technological turbulence had no moderating effect on the relationship between entrepreneurial orientation and organisational ambidexterity.

The finding that there was no moderation of technological turbulence on entrepreneurial orientation and organisational ambidexterity could be attributed to the fact technological developments have various levels of turbulence that manifest at different phases of the technology's lifecycle (Adner & Kapoor, 2016). Therefore, the technological S-curve is best suited to determine the effect of the moderating role of technological turbulence (Adner & Kapoor, 2016). However, the study could not employ the S-curve, because the data were collected cross-sectionally, while technological turbulence could follow a life cycle using longitudinal data. As the

standard way to depict the evolution of a given technology, the S-curve would give insights into the dynamics of technological development. For example, technologies are part of an ecosystem that must be considered before substituting them; therefore, its adoption is evaluated based on how it interacts with other system components (Adner & Kapoor, 2016; Chandrasekaran et al., 2022). As explained by Muhlroth and Grottke (2022), the advent of new technologies does not always imply that they will replace the pre-existing ones.

Existing and new technologies interact, but their relationships are not always uniform and can range from mutually beneficial to mutually destructive, as demonstrated by the S-curve (Adner & Kapoor, 2016). In a symbiotic interaction, the development of new technologies fosters the development of already-existing ones (Adner & Kapoor, 2016; Muhlroth & Grottke, 2022), whereas in a predator-prey interaction, the other is disadvantageous, either the new or the existing technology gains (Adner & Kapoor, 2016; Muhlroth & Grottke, 2022). In a purely competitive interaction, one technology can substitute the other (Muhlroth & Grottke, 2022).

This provided insight that while technological turbulence had no moderating effect on entrepreneurial orientation and organisational ambidexterity, technological turbulence is a predictor of exploratory innovation. Therefore, H2a, H2b, and H2c were not supported.

6.6. Additional insights

Additional insights from the results highlighted that a statistically significant relationship existed between technological turbulence and exploratory innovation ($\beta = 0.176$, $p < .01$). However, there was no statistically significant relationship between the technological turbulence and exploitative innovation with p-value higher than 5% ($p = 0.294$). H1 demonstrated that entrepreneurial orientation is a predictor of organisational ambidexterity. However, technological turbulence is a predictor of explorative innovation and not for exploitative innovation. This could be attributed to SMMEs' perception that there is high technological turbulence in their industries, denoted by a mean score of 4.25. Therefore, against popular belief, these insights confirmed Luger et al.'s (2018) proposition that "if external contexts demand stronger alignment with either exploration or exploitation", then firms depart from a state of ambidexterity (p. 450). However, the findings also indicated that no new products were developed through technological breakthroughs; this was denoted by a mean score of 3.96. This was consistent with Gupta et al. (2006) and Bodlaj and Čater's (2019) assertion that exploration often results in failed innovation. Given a high OA7 mean score of 4.07, denoting the firms' propensity for search for new opportunities in new markets; exploratory innovation was most likely to result in a self-reinforcement failure trap (Gupta et al.,

2006). This could be one of the reasons why the rate of SMME failure is high in South Africa (Dele-Ijagbulu et al., 2020) .

6.7. Summary of results from hypotheses testing

In summary, the results from hypothesis 1 demonstrated that there was a significant correlation between entrepreneurial orientation and organisational ambidexterity. However, hypothesis 2 demonstrated that there was no moderation of technological turbulence on the relationship between entrepreneurial orientation and organisational ambidexterity. As a result, the below conceptual model reflect the relationships between constructs, based on the findings of the study.

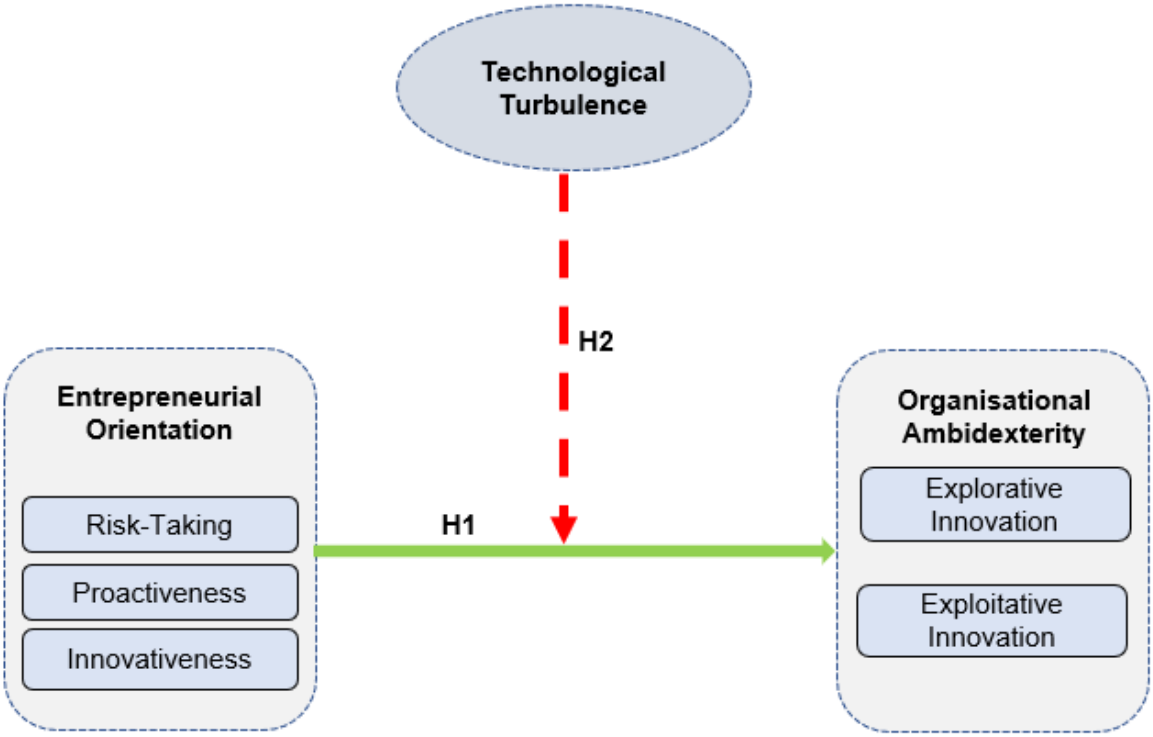

Figure 9 Results from hypotheses testing

6.8. Conclusion

Chapter 6 discussed the finding of the study and presented the conceptual model based on the results. The next chapter presents the conclusions, implications of the study, and recommendations for future research

7. CHAPTER 7 – CONCLUSIONS AND RECOMMENDATIONS

7.1. Introduction

Chapter 7 underscores the principal conclusions and discusses the implications of the research for management. Furthermore, it discusses the theoretical implications in the field of academia, and then provides the limitations of the research. Finally, the paper concludes with suggested directions for future research studies in the domain of entrepreneurship.

7.2. Principal Conclusions

This research study aimed to gain a deeper understanding of the mechanisms underlying the relationship between entrepreneurial orientation and organisational ambidexterity (Covin & Wales, 2019). The underlying presumption of this study was that the exponential rate of change in technology brought on by technological turbulence were to moderate the relationship between entrepreneurial orientation and organisational ambidexterity (Y. Lee & Kreiser, 2018; C. Wang et al., 2022), while the existing scales of entrepreneurial orientation, organisational ambidexterity, and technological turbulence were developed in different contexts. However, to achieve the aim of the study, the existing instruments were validated for SMMEs in a South African context.

The study advanced the works of Covin and Wales (2019), who argue that an entrepreneurial orientation is innately exploratory, with a focus on searching for new opportunities, than it is with exploitation; yet, both exploration and exploitation occur in a state of ambidexterity (Jansen, van den Bosch et al., 2006). The study extended the work of Lee and Kreiser, (2018), who argue that organisational ambidexterity is more valuable for SMMEs. They advocate for an examination of the relationship between entrepreneurial orientation and organisational ambidexterity in the context of contingencies such as technological turbulence.

Chapter 3 presented the hypotheses tests that were conducted. The first hypothesis indicated that entrepreneurial orientation is a predictor of organisational ambidexterity. This was consistent with the findings of a similar study conducted by Lisboa et al. (2016) and it confirmed Rosenbusch et al.'s (2013) view that entrepreneurial orientation involves exploration and exploitation of new opportunities.

The findings of the second hypothesis demonstrated that technological turbulence does not moderate the relationship between entrepreneurial orientation and organisational ambidexterity. Therefore, it did not support Lee and Kreiser's (2018) presumption that environmental context

influences the relationship between entrepreneurial orientation and organisational ambidexterity. However, an additional insight emerged from the study's findings. In a technologically turbulent environment, SMMEs do not leverage on emerging technologies to exploit current product-market domains, which suggested that organisations depart from a state of ambidexterity, when the external context requires a stronger alignment with a particular orientation (Luger et al., 2018).

7.3. Implications for Management

Entrepreneurial orientation has been positioned as a potential source of improving a firm's ambidextrous strategy in a turbulent environment. This study supported the findings by Lisboa et. al. (2016) and Rosenbusch et al. (2013), as the findings indicated that there was a strong correlation between entrepreneurial orientation and organisational ambidexterity. Entrepreneurial orientation predicts exploration 61% and 60% exploitation. The findings validated Rosenbusch et al.'s (2013) assertion that entrepreneurial orientation is a crucial component of strategic decision-making and resource allocation that promote the exploration and exploitation of opportunities. Only firms that adopt the appropriate strategic orientation in a given context may be able to take advantage of the opportunities the environment presents (Rosenbusch et al., 2013).

Adaptation to technological changes is one of the most crucial challenges firms must contend with for their long-term survival (Christensen et al., 2018; Saerom. Lee & Csaszar, 2020; Taylor & Helfat, 2009). The threat of obsolescence or falling behind competitors' efforts accentuates the need to cultivate entrepreneurial thinking skills, which can influence and shape the future of SMMEs in the face of technological turbulence (Rose & Mamabolo, 2019). However, despite the important role of technology, the study found that technological turbulence does not moderate the relationship between entrepreneurial orientation and organisational ambidexterity.

Additional insights from the findings demonstrated that technological turbulence is a predictor of exploratory innovation, while it is not a predictor of exploitative innovation. This suggests that firms experience challenges in adapting to rapid technological change, where one core technology replaces the pre-existing one (Eggers & Francis Park, 2018; Saerom. Lee & Csaszar, 2020; Taylor & Helfat, 2009). Yet, in the face of newly required competencies, some organisations successfully make the transition across waves of technological change (Eggers & Francis Park, 2018; Taylor & Helfat, 2009). The findings from this study suggest that technological turbulence, which triggers architectural changes to its core technology, results in firms pursuing exploratory activities at the expense of exploitation (Benner & Tushman, 2003; Taylor & Helfat, 2009). However, too much exploration at the expense of exploitation breeds competence rigidity and leads to a failure trap (Gupta et al., 2006; Luger et al., 2018).

7.4. Theoretical Implications

The study makes contributions in the domains of entrepreneurship and organisational management, as it contributes to both entrepreneurship and organisational ambidexterity research. The research built on emerging literature, which posited that organisational ambidexterity was mostly important in SMMEs and these are often resource constrained firms (Y. Lee & Kreiser, 2018). However, Covin and Wales (2019) state that only the exploratory dimension of organisational ambidexterity is associated with entrepreneurial orientation. Therefore, this study provided empirical evidence that clarified that entrepreneurial orientation is a predictor of both dimensions of organisational ambidexterity, in accordance with Rosenbusch et al. (2013) and Lisboa et al. (2016). Therefore, the three dimensions of entrepreneurial orientation are essential for radical innovation (exploration) and incremental innovation (exploitation) (Covin et al., 2020; Lisboa et al., 2016). However, a combination of risk-taking and innovativeness is sufficient to achieve a state of ambidexterity (Lisboa et al., 2016).

Covin and Wales' (2019) accentuate the importance of identifying a strategic approach that complements entrepreneurial orientation, and in combination, they promote the long-term viability of organisations. Levinthal and March's (1993) perceived that organisations need to "engage in enough exploitation to ensure the organisation's current viability and engage in enough exploration to ensure its future viability" (p. 105). While Covin et al. (2020) posit that the extant literature has ample empirical evidence demonstrating that entrepreneurial orientation increases firm performance and growth, this study provided the empirical evidence on the correlation between entrepreneurial orientation and organisational ambidexterity, which confirmed that the combination of both constructs results in long-term performance of SMMEs.

The central question in technological turbulence has switched from why firms fail to why certain organisations adapt and flourish, while others remain inert and fail, in the face of technological change (Eggers & Francis Park, 2018). This study took three distinct constructs and examined their interrelatedness and advanced the knowledge on the dynamics of technological turbulence and the adaptation of firms. Entrepreneurial orientation is well-suited to coping with rapidly changing environmental contexts (Covin et al., 2020). Covin et al. (2020) argue that proactiveness enables firms to anticipate and sense opportunities that are presented by the contextual environment (Teece et al., 1997), while risk-taking enables a firm to take bold leaps in the face of uncertainty (Duncan, 1972; Putniņš & Sauka, 2019). Therefore, entrepreneurial orientation enables firms to effectively respond to the demands of technological turbulence (Ferreras-Méndez et al., 2022), while organisational ambidexterity is a strategic orientation that enables the short-

term and long-term survival of firms in turbulent environments (Jansen, van den Bosch et al., 2006; Levinthal & March, 1993). Yet, this study found additional insights that are critical; technological turbulence had no moderating effect on the relationship between entrepreneurial orientation and organisational ambidexterity.

Entrepreneurial orientation is a predictor of organisational ambidexterity, and therefore, the study demonstrated that SMMEs are ambidextrous organisations. However, the study also demonstrated that technological turbulence is a predictor of explorative innovation, and there was no correlation between technological turbulence and exploitative innovation. Therefore, the study advanced Luger et al.'s (2018) proposition that firms depart from a state of ambidexterity, where the environmental context presents an exigent for strong alignment with either exploratory or exploitative innovation. In a technological turbulence, Taylor and Helfat (2009) argued that "technological innovation sometimes requires firms to shift completely to a new core technology" (p. 718). Therefore, Taylor and Helfat (2009) argued that successfully navigating a technological transition frequently necessitated the exploitation of existing complementary assets to support the new exploratory technology.

Taylor and Helfat (2009) further argued that this presents an ambidextrous challenge for firms, because in some circumstances, existing complementary assets become less valuable and an ambidextrous coupling of new core technology and complementary assets is inappropriate (Eggers & Francis Park, 2018; Raisch et al., 2009; Taylor & Helfat, 2009). Consequently, firms depart from a state of ambidexterity in pursuit of building a completely new technological capability and exploring new opportunities (Luger et al., 2018; Taylor & Helfat, 2009). This suggests that while organisational ambidexterity is valuable, it is not always appropriate, depending on the context and the circumstances firms find themselves in (Luger et al., 2018; Taylor & Helfat, 2009).

7.5. Limitations of the Research

A discussion of the potential variables that could have affected the outcomes is provided in this section.

7.5.1. Bias

Although statistical methods were employed to mitigate the bias constraint, some bias may persist in the dataset, which could restrict the robustness of the results (Doyle et al., 2016).

7.5.2. Population of the study

The population of the study had to be chosen according to the availability of participants and it did not reflect the total universe of SMMEs. This limited the generalisability of the findings.

7.5.3. Sample method

Selection of study participants, who met the sampling requirements was done using non-probability, purposive sampling procedures. Therefore, judgement was exercised in selecting the sample, and as such, the generalisability of the study's findings is restricted (Vehovar et al., 2016).

7.5.4. Cross-sectional study

A cross-sectional methodology was used in the study, which only offered a snapshot of the data at one specific point in time. Given the ecosystem environment, in which technology operates, the rate of technological turbulence varies with each phase of technological development (Adner & Kapoor, 2016). Therefore, this limits the robustness of the findings.

7.6. Recommendations for Future Research

The aim of the study was to determine the extent to which technological turbulence moderates the correlation between entrepreneurial orientation and organisational ambidexterity. This research aim was attained through quantitative analysis, which involved first, examining the individual correlations between entrepreneurial orientation and organisational ambidexterity. Second, it meant the researcher evaluate the moderating effects of technological turbulence on the correlation between entrepreneurial orientation and organisational ambidexterity. However, a similar research study using longitudinal data is recommended on the basis that the dynamics of technological turbulence can manifest differently at each phase of the technology's development (Adner & Kapoor, 2016; Chandrasekaran et al., 2022).

It was concluded that entrepreneurial orientation is a precursor for organisational ambidexterity; however, given that SMMEs are more vulnerable to failed innovations because of a lack of resources, it remains unclear as to how SMMEs allocate their resources to achieve an ambidextrous strategy (Bodlaj & Čater, 2019). Therefore, future research could investigate this phenomenon. In context of technological turbulence, the necessity to take strategic decision-making into account as a significant element within the manifestation of entrepreneurial orientation is an essential, which could complement this study (Lee & Csaszar, 2020). A conceptual lens on managerial cognition could help to create theories about how, why, and when

SMMEs prioritise new technology over pre-existing one, and how this permeates their entrepreneurial choices (Eggers & Francis Park, 2018; Lee & Csaszar, 2020).

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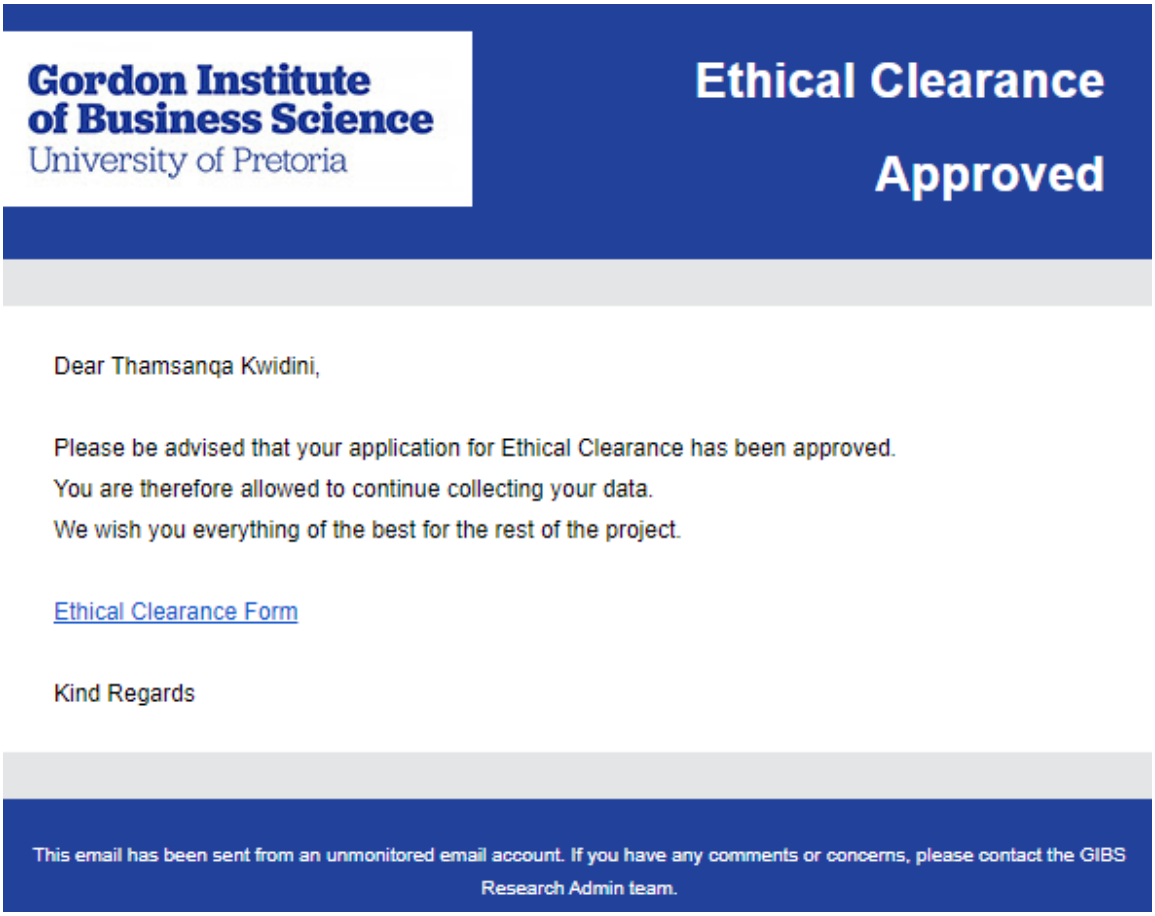
APPENDIX 1 – ETHICAL CLEARANCE



Gordon Institute of Business Science
University of Pretoria

Ethical Clearance Approved

Dear Thamsanqa Kwidini,

Please be advised that your application for Ethical Clearance has been approved.
You are therefore allowed to continue collecting your data.
We wish you everything of the best for the rest of the project.

Ethical Clearance Form

Kind Regards

This email has been sent from an unmonitored email account. If you have any comments or concerns, please contact the GIBS Research Admin team.

APPENDIX 2 – PARTICIPANT CONSENT FORM

The Moderating Role of Technological Turbulence on Entrepreneurial Orientation and Organisational Ambidexterity

Dear Participant,

I am currently a student at the University of Pretoria's Gordon Institute of Business Science and completing my research in partial fulfillment of an MBA.

I am conducting a research on the moderating role of technological turbulence on entrepreneurial orientation and organisational ambidexterity. Technological turbulence refers to the rate of technological change in an industry. Entrepreneurial orientation refers to a firm's innovativeness, risk-taking, and proactiveness in opportunity seeking. Organisational ambidexterity refers to the firm's ability to simultaneously pursue both explorative (discontinuous) and exploitative (incremental) innovation. This research will help us understand how the rate of technological change moderates the influence of entrepreneurial orientation on organisational ambidexterity.

To that end, I would appreciate your participation in this online survey. This should take no more than 15 minutes of your time. Your participation is voluntary, and you can withdraw at any time without penalty. Your participation is anonymous and only aggregated data will be reported. By completing this survey, you indicate that you voluntarily participate in this research. If you have any concerns, please contact my research supervisor or me. Our details are provided below.

Researcher Name: Thamsanqa Kwidini
Email: 17195609@mygibs.co.za

Research Supervisor: Prof. Anastacia Mamabolo
Email: mamaboloa@gibs.co.za

APPENDIX 2 – ONLINE SURVEY QUESTIONNAIRE

Is your organisation established in South Africa?	Yes ☐ No ☐
What is your role in the firm	Owner/Shareholder ☐ Director ☐ Manager ☐ Other ☐
Industry	Agriculture Mining and Quarrying Manufacturing Electricity, Gas and Water Construction Retail Motor Trade and Repair Services Wholesale Catering, Accommodation and Tourism Transport and Storage Communications Finance and Business Services Community, Social and Personal Services Other
Enterprise Classification	Medium ☐ Small ☐ Micro ☐
Number of Employees	0 – 10 ☐ 11 – 50 ☐ 51 – 250 ☐ more than 250 ☐

Source: Adopted from the Department of Small Business Development (2019)

Section 2: Entrepreneurial Orientation

	Strongly Agree	Agree	Uncertain/ not important	Disagree	Strongly Disagree
Innovativeness					
We actively introduce improvements and innovations in our business	☐	☐	☐	☐	☐
Our business is creative in its methods of operation	☐	☐	☐	☐	☐
Our business seeks new ways of doing things	☐	☐	☐	☐	☐
We favour a strong emphasis on R&D, technological leadership, and innovation	☐	☐	☐	☐	☐
My firm has marketed many new lines of products in the past 3 years	☐	☐	☐	☐	☐
Changes in our product lines have usually been quite dramatic	☐	☐	☐	☐	☐
Our organisation seeks innovative ways to co-create added value with customers	☐	☐	☐	☐	☐
Our organisation experiments with innovative market approaches	☐	☐	☐	☐	☐
Our organisation collaboratively creates value with distributors in innovative ways	☐	☐	☐	☐	☐
Proactiveness					
We initiate actions to which competitors respond	☐	☐	☐	☐	☐
We are very often the first business to introduce new products, administrative techniques, operating technologies, etc.	☐	☐	☐	☐	☐
Our organisation seeks to discover unmet customer needs	☐	☐	☐	☐	☐
Our organisation develops solutions to address unstated customer needs	☐	☐	☐	☐	☐
Our organisation innovates even at the risk of making our own products obsolete	☐	☐	☐	☐	☐
Our organisation monitors trends to understand what users will need in the future	☐	☐	☐	☐	☐
We excel at identifying opportunities	☐	☐	☐	☐	☐

We initiate actions to which other organisations respond	☐ ☐ ☐ ☐ ☐
Risk Taking	
We have a strong propensity for high-risk projects (with chances of very high returns)	☐ ☐ ☐ ☐ ☐
We believe, owing to the nature of our business environment, that bold, wide-ranging acts are necessary to achieve the firm's objectives	☐ ☐ ☐ ☐ ☐
When there is uncertainty, we typically adopt an aggressive posture so that we maximise the probability of exploiting potential opportunities	☐ ☐ ☐ ☐ ☐
The term 'risk taker' is considered a positive attribute for people in our business	☐ ☐ ☐ ☐ ☐
People in our business are encouraged to take calculated risks with new ideas	☐ ☐ ☐ ☐ ☐
Our business emphasises both exploration and experimentation for opportunities	☐ ☐ ☐ ☐ ☐

Source: Adopted from Huang et al. (2021) and Kachouie et al. (2018)

Section 3: Organisational Ambidexterity

	Strongly Agree	Agree	Uncertain/ not important	Disagree	Strongly Disagree
Exploratory Innovation					
Our firm accepts demands that go beyond existing products and services	☐	☐	☐	☐	☐
We invent new products and services	☐	☐	☐	☐	☐
We experiment with new products and services in our local market	☐	☐	☐	☐	☐
We commercialise products and services that are completely new to our firm	☐	☐	☐	☐	☐
We frequently utilise new opportunities in new markets	☐	☐	☐	☐	☐
Our firm regularly uses new distribution channels	☐	☐	☐	☐	☐
We regularly search for and approach new clients in new market	☐	☐	☐	☐	☐
Exploitative Innovation					
We improve our provision's efficiency of products and services	☐	☐	☐	☐	☐
We introduce improved, but existing products and services for our local market	☐	☐	☐	☐	☐

We regularly implement small adaptations to existing products and services	☐ ☐ ☐ ☐ ☐
We frequently refine the provision of existing products and services	☐ ☐ ☐ ☐ ☐
We frequently refine the provision of existing products and services	☐ ☐ ☐ ☐ ☐
We regularly implement small adaptations to existing products and services	☐ ☐ ☐ ☐ ☐
We increase the economies of scale in existing markets	☐ ☐ ☐ ☐ ☐
Our organisation expands services for existing clients	☐ ☐ ☐ ☐ ☐
Lowering costs of internal processes is an important objective	☐ ☐ ☐ ☐ ☐

Source: Adopted from Jansen et al. (2006)

Section 4: Technological Turbulence

	Strongly Agree	Agree	Uncertain/ not important	Disagree	Strongly Disagree
I believe that technological developments in our industry are fairly major	☐	☐	☐	☐	☐
New product ideas have been made possible through technological breakthroughs in my firm	☐	☐	☐	☐	☐
New customers have product needs that are different from our existing customers in my firm	☐	☐	☐	☐	☐
Difficult to forecast technology developments in our industry	☐	☐	☐	☐	☐
Technology environment highly uncertain	☐	☐	☐	☐	☐
Technological developments highly unpredictable	☐	☐	☐	☐	☐
Technologically complex environment	☐	☐	☐	☐	☐
We have demand for our products from customers who have never bought before from my firm	☐	☐	☐	☐	☐
Our customers tend to look for new products all the time	☐	☐	☐	☐	☐
In our kind of business, customers' preferences tend to change quite a bit over time	☐	☐	☐	☐	☐
Technology in our industry is changing rapidly	☐	☐	☐	☐	☐

In our principal industry, the modes of production and service change often	☐ ☐ ☐ ☐ ☐
In our principal industry, the modes of production and service change in major ways as opposed to slowly evolving	☐ ☐ ☐ ☐ ☐
Newly developed technologies and processes in our industry can easily become out of date	☐ ☐ ☐ ☐ ☐
It is difficult to forecast technological developments in our industry	☐ ☐ ☐ ☐ ☐

Source: Adopted from Hina et al. (2021) and Santos et al. (2021) and Wu et al. (2017)

Section 5: Market Turbulence

	Strongly Agree	Agree	Uncertain/ not important	Disagree	Strongly Disagree
Customer tastes and preferences change unpredictably in our market	☐	☐	☐	☐	☐
Competition in our market is cutthroat	☐	☐	☐	☐	☐
The technology in our industry is changing rapidly	☐	☐	☐	☐	☐
Customer product demands and preferences highly uncertain	☐	☐	☐	☐	☐
Difficult to predict changes in customer needs and preferences	☐	☐	☐	☐	☐
Market competitive conditions highly unpredictable	☐	☐	☐	☐	☐

Source : Lisboa et al. (2011) and Wang et al. (2015)