ENTREPRENEURIAL ORIENTATION, TECHNOLOGICAL CAPABILITY, ENVIRONMENTAL DYNAMISM AND FIRM INNOVATIVENESS IN MANUFACTURING SMALL AND MEDIUM ENTERPRISES IN NAIROBI CITY COUNTY, KENYA

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A THESIS SUBMITTED IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE AWARD OF THE DEGREE OF DOCTOR OF PHILOSOPHY IN BUSINESS ADMINISTRATION, SCHOOL OF BUSINESS, UNIVERSITY OF NAIROBI.

JULY 2020

DECLARATION

This Thesis is my original work and has not been submitted for a degree course in any other University.

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DEDICATION

Posthumously, I dedicate this thesis to my late father Anakleti Ososo Mkalama and my mother Jane Mkalama for having aptly planted and propagated the seed of knowledge in me.

I further dedicate this thesis to my family, my dearest wife Rose, children Lynda, Kate and Nathan and of course the best company of them all – grandson Sean! May this inspire you...

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All glory and honour be to Him, for He has fought this battle for me!

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‘I will praise thee, O Lord my God, with all my heart: and I will glorify thy name for evermore’ …… Psalm 86:12

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LIST OF ABBREVIATIONS AND ACRONYMS

ARIPO	African Regional Intellectual Property Office
AVE	Average Variance Extracted
CR	Composite Reliability
CV	Coefficient of Variation
DOI	Diffusion of Innovation Theory
ED	Environmental Dynamism
EO	Entrepreneurial Orientation
FI	Firm Innovativeness
GDP	Gross Domestic Product
GII	Global Innovation Index
GOK	Government of Kenya
GST	General Systems Theory
GT	Game Theory
HRM	Hierarchical Regression Modelling
IOT	Industrial Organisation Theory
IPR	Intellectual Property Rights
ITO	Institutional Theory of Organisations
KAM	Kenya Association of Manufacturers
KIPI	Kenya Industrial Property Institute
MAR	Missing at Random
MCAR	Missing Completely at Random
MBD	Missing by Design

MRM	Multiple Regression Model
MSME	Micro, Small and Medium Enterprises
NACOSTI	National Council of Science and Technology
NMAR	Not Missing at Random
OECD	Organisation for Economic Co-operation and Development
OIM	Open Innovation Model
PCA	Principal Component Analysis
RBT	Resource Based Theory
RBV	Resource-Based View
R&D	Research and Development
SCP	Structure-Conduct-Performance
SEM	Structural Equation Modelling
SME	Small and Medium Enterprises
STI	Science, Technology and Innovation
SPSS	Statistical Package for Social Science
TC	Technological Capability
TI	Technology Index of the World Economic Forum (WEF).
WIPO	World Intellectual Property Office

ABSTRACT

The study sought to establish the factors that influence innovativeness within manufacturing Small and Medium Enterprises (SMEs) in Kenya. The general objective of the study was to establish, analyse and determine the effect of entrepreneurial orientation, technological capability and environmental dynamism on firm innovativeness within manufacturing SMEs in Nairobi County. The guiding philosophy of the research was realism philosophy. The study was anchored on five theories namely General Systems Theory as the main anchor, the Resource Based View, the Industrial Organisation Theory and the Institutional Theory of Organisations. A triangulated research design was adopted. Four hypotheses were formulated. Technological capability as a mediating and environmental dynamism as a moderating variable, were conceptualized as affecting the relationship between entrepreneurial orientation and firm innovativeness. Stratified random sampling was applied to obtain 363 samples. A series of descriptive and inferential analyses were carried out on the primary data that was collected. The study also purposively identified and qualitatively studied four cases. Entrepreneurial orientation was established as having a significant effect on firm innovativeness. The study also confirmed that there was a moderating effect of environmental dynamism on the relationship between entrepreneurial orientation and firm innovativeness. The effect of technological capability on the relationship between entrepreneurial orientation and firm innovativeness was inconclusive. The study further confirmed that the joint relationship between entrepreneurial orientation, technological capability, and environmental dynamism had an effect on firm innovativeness. These findings were triangulated by the qualitative study. The study has made a contribution to theory, policy and management in relation to innovativeness in SMEs. The study recommended additional contextual bases studies on the variables. It also recommended that active decision-making on the basis of internal and external circumstances as being important for a firm to be innovative. The study also recommended a raft of policy considerations that sought to address the diffusion of innovation across various SME segments. The study had a number of limitations which included the use of a cross-sectional survey approach method and the use of a single respondent in data collection. This may have led to biases and not addressed causalities. The study recommended that future studies should consider exploratory designs, apply longitudinal methods and make use of multiple respondents.

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

Firm Innovativeness affects the functioning and advancement of Small and medium enterprises (SMEs) (Ngugi, Mcorege, & Muiru, 2013; Hochleitner, Arbussa, & Coenders, 2017; Games, 2019; Bor, 2018; Hintergger, Durst, Temal, & Yesilay, 2019). In his seminal article, Miller (1983), isolated innovation as one of the factors that affected entrepreneurial orientation and ultimately led to superior firm performance. Kuratko, Ireland, and Hornsby (2001) demonstrated that a firm whose fortunes were dwindling, was able to utilize innovation in its operations, turn it around and even grow to greater heights. These findings were consistent with the original findings of Schumpeter (1934) who argued that innovation is essential for firms to regenerate themselves and attain significant growth.

Innovation comes about as a result of the strategic activities of the firm owners (Miller, 1983; Covin & Slevin, 1989) and their employees, who are sufficiently inspired by their leaders (Kuratko et al., 2001). The need for organizations to become innovative is driven by the fact that at some stage of their growth, there is a need for organizations to reinvent themselves in a Schumpeterian fashion so that they may either survive or outpace their competition (Kuratko et al., 2001; Otieno, Bwisa, & Kihoro, 2012; Soininen, Puumalainen, Sjogren, & Syrja, 2012).

Firm Innovativeness is evident within the SMEs, which have also been recognised as key contributors to economic growth, but unfortunately, there is no convergence of knowledge on the triggers for innovativeness and growth in SMEs (Freel, 2000; Gilbert, 2007; Ejdys, 2016; Wales, 2016; Hochleitner et al., 2017; Games, 2019). In as much as entrepreneurial orientation (EO) has been acknowledged to contribute notably to firm innovativeness (FI), it is equally imperative to additionally conceptualise the internal capability and external environmental factors that affect the association. This is an significant area in which there has not been convincing research and there is, therefore insufficient conceptualisation (Ucbasaran, Westhead, Wright, & Flores, 2009; Ejdys, 2016; Wales, 2016; Pustovrh, Jaklic, Martin, & Raskovic, 2017; Mkalama, Ndemo, & Maalu, 2018).

Despite contributing considerably to the Kenyan economy, manufacturing SMEs have been associated to little computerisation assessed at 32% within the segment and low value addition and subsequent low productivity (GOK, 2013; KNBS, 2016; KAM, 2019; Ndemo & Mkalama, 2018). A common concern is how to increase the level of innovation within the SMEs, in Kenya and secondly, how to promote automation and to increase efficiencies (KAM, 2019).

Martinez-Roman and Romero (2017) established that a firm's characteristics have a significant influence its innovative activity. A descriptive study was carried out by Gachara and Munjure (2018) to identify the challenges to innovation, but it did not study the relationship between the firm profiles and innovativeness. A study by Voeten (2015) established that whereas many manufacturing SMEs in Kenya introduced different processes, products and technology in their businesses, they hardly kept any systematic information on Research and Development (R&D) expenditure, and mostly did not register patents. Voeten (2015) showed that much innovation depended on incremental and exploitation innovation rather than major technological breakthrough and that many firm owners developed their innovations by simply having conscious and systematic trials and changes to their products and processes. This notwithstanding, all the firms studied by Voeten (2015) were able to demonstrate the three elements of newness, process change and value creation associated with innovativeness.

Internal capabilities were also identified as areas that affected firm innovativeness of Kenyan SMEs (Voeten, 2015). These capabilities included the owners' entrepreneurial orientation. Entrepreneurial orientation affected the individual's vision, resilience, as well as motivation to continually improve their businesses (Covin & Slevin, 1989; Kuratko et al., 2001). However, the degree of pan-organisational creativity varied with different organisations (Voeten, 2015; Martinez-Roman & Romero, 2017) and was actually dependent on the complexity of the firm.

Scholars also argued that institutional and non-institutional external factors also played a major part in the innovativeness of SMEs (Martinez-Roman & Romero, 2017). Voeten (2015) identified these factors as being derived from both the formal and informal institutions, and included government-led Science, Technology and Innovation (STI) policies as well as R&D and technology development centres, innovation and research funds, access to credit and financial markets, patent and trademark registration. Inasmuch as there has been concerted effort in the development and review of supportive government policies, the impact has not been felt and the feeling is that the government practice is bureaucratic and restrictive in nature (Voeten, 2015; Ndemo & Mkalama, 2018). There are recurring themes that question the precursors to the innovation process and more so, the firm and ex-firm level interactions that affect the innovativeness of SMEs (Ucbasaran et al., 2009; Wales, 2016; Martinez-Roman & Romero, 2017; Pustovrh et al., 2017).

In the study, several theories were integrated and utilized to discuss the association amongst different variables. The anchoring theory in this study was the General Systems Theory (GST) that was coined in the early twentieth century by Ludwing von Bertanlanffy. An application of GST, the Open Innovation Model (OIM) as popularised by Henry Chesbrough (du Preez & Louw, 2008; Chesbrough, 2003) was used extensively in the study. The OIM uses both internal and external concepts and networks at all stages of the process to support innovation (Chesbrough, 2003) unlike in prior models, which had specific entry points for feedback and ideas (du Preez & Louw, 2008). Accordingly, internal and other external networks that embraced the experience of other formal actors generated and developed ideas that were subsequently accepted and utilised in the firm (Chesbrough, 2003; du Preez & Louw, 2008). This phenomenon is prevalent in situations of strategic alliances, networks and partnerships and even in the use of external research (International Chamber of Commerce, 2014). The use of open innovation in the discourse on SME innovation has recently gained currency (de Beer & Armstrong, 2015; Hochleitner et al., 2017; Pustovrh, 2017; Hintergger et al., 2019).

Complementing this model was the Everret Roger's 1962 Diffusion of Innovation Theory (DOI). DOI posits that diffusion is the process by which an innovation spreads over a period of time within a large community. For diffusion to occur, the following four essential requirements must be in place; an innovation that distinctly provides value; a communication channel, which would allow the proponents to advocate the innovation; time to allow the spread of the innovation and this varies depending on the other circumstances, and finally, a social system that includes both internal and external interfaces allowing interaction between the proponents and protagonists of the innovation (Rogers, 1995). Being as it is, the society does not converge to make a collective decision to adopt the innovation, each member of the social systems undergoes a series of self-reflected steps that include being aware of the innovation and some ideas on its functionality; being persuaded on its functionality, thereby forming a favourable view of it; conscious decision to accept or reject the innovation; putting to use the idea or its implementation; and finally confirming acceptance of the results of the innovation after evaluating the results. Innovators are categorized in various stages ranging from early adopters to laggards depending with their level of uptake of the innovation. It is that ability to recognise and diffuse innovation thereby creating new opportunity, combinations or processes that is considered as EO.

Complementing these models was the Resource-based View (RBV) articulated by Birger Wernerfelt in 1984, which argued that a firm had limited resources and its own innovativeness was on the basis of the available resources and its interpretation of the available opportunity (Wernerfelt, 1984; Barney, 1991; Wernerfelt, 1995; Patel & Pavitt, 2000; Tidd, Bessant, & Pavitt, 2001). Firms therefore, differentiated themselves on the basis of the valuable, unique, inimitable and limited resources that exist within (Wernerfelt, 1995) and not on the basis of a market nor a research-driven need (Lawson, 2001). The available resources include monetary, material, human, high-tech, reputational or administrative resources (Barney, 1991).

According to Schumpeter (1934), an entrepreneur's responsibility is to create new combinations of these resources in such a manner that either prior performance is exceeded, new products are produced, new processes are simplified without compromising the quality of the produced goods and services, new raw materials are now in use or even a new organisational structure. The study is derived from preceding studies and viewed the construct of technological capability from the lens of RBV (Davidsson, Steffens, & Fitzsimmons, 2009; Ngugi et al., 2013; Woschke, Haase, & Kratzer, 2017).

The Industrial Organisation Theory (IOT), which was originated by Alfred Marshall in the late 18th Century (Conner, 1991), anchored the discussions around the external factors that affect firm innovativeness. There have been developments since its origination, and there are now five strands of this theory (Conner, 1991). The most relevant in this study was the Bain School, which argued that a firm's strategy was determined by the industrial environment or market structure in which the firm operated (Conner, 1991). The Structure-Conduct-Performance (SCP) Paradigm within IOT, postulated that the market structure affected its behaviour otherwise known as conduct, which in turn, affected its performance (Bain, 1986; Casidy, Nyadzayo, & Mohan, 2019).

Fundamentally, this relates to a set of inherent capabilities and certain external influences, that affected how firms behaved within an environment. This behaviour, compelled the firms to carry out certain tasks that subsequently lead to specific results on performance outcomes (Harwood, 1996). As a result of this, there could be a counteractive reaction, causing the market structure to readjust (Tung, Lin, & Wang, 2010). Borrowing from previous studies on SMEs, a variant of the IOT, Game Theory was also used to anchor the study (Brown & Shoham, 2008; Gnyawali & Park, 2009). Having being in existence from the early 19th Century, Game Theory was popularised by John Nash in the 1950s, by a demonstration that finite games by rational self-seeking players always have a definite equilibrium (Brown & Shoham, 2008).

The study also borrowed from previous studies that anchored SME studies on the Institutional Theory of Organisations (ITO) (Minh & Hjortso, 2015), whereby both the internal and external factors will be viewed from the lens of ITO. With its initial origins in the mid-19th century, ITO postulates on social structures and is considered to be the rationally accepted pattern of interactions within a set of individuals and the external environment. Philip Selznick was instrumental in the foundational work on modern ITO, in which he perceived organisations as organisms that adapted to external threats (Selznik, 1948). He argued that formal and informal structures within organisations were consistently in tension against the external environment. Institutions are considered to be both the formal and informal sets of beliefs, rules, and norms, ultimately affecting the creation of a homogenous outcome on behaviour, growth and spreading these outcomes. These rules can be regulative, cognitive or normative. Within the institution, a general compliance to the formal and informal rules creates acceptance, legitimacy, avoids conflicts and creates cohesiveness of the organism's general goals (Berthod, 2017).

ITO revolves around relationships on power, politics, change, as well as choices to obtain standard practices and behaviours irrespective of the resources and external environment that is available to the organisation (Berthod, 2017). There are consistent pressures on an organisation's pattern of behaviour due to either internal or external influence and any adverse changes to the external environment will attract a re-evaluation of the institution's set of norms and behaviours, with a view to sustaining the longevity of the organism (Berthod, 2017). Changes perceived to be non-adverse will obtain complementary behaviour from the organisation (Bruton, Ahlstrom, & Li, 2010).

Although these models describe the association between entrepreneurial orientation and supplementary outcomes, they neither clarify the antecedents of innovation nor do they investigate the relationship with past innovation itself. Moreover, these models do not exhaustively study the relationship between internal and external variables that affect entrepreneurial orientation to have an outcome of innovativeness. Whereas the discourse concerning entrepreneurial orientation and performance has been comprehensively discoursed (Dess, 2005; Wiklund and Shepherd, 2005; Avlonitis & Salavou, 2007; Rauch, Wiklund, Lumpkin, & Frese, 2009; George and Marino, 2011), the antecedents of innovativeness have not been fully conceptualised (Ruiz-Ortega, Parra-Requena, Rodrigo-Alarcon, & Garcia-Villaverde, 2013; Ejdys, 2016, Wales 2016). There is therefore a persuasive motivation to disaggregate the correlation between entrepreneurial orientation and performance and instead study the antecedents of innovativeness. An approach that studies the relationship between entrepreneurial orientation, organisational characteristics, technological capability and the external environmental dynamism, is thus adopted.

1.1.1 Entrepreneurial Orientation

Advanced from the pioneering work of Mintzberg (1973), entrepreneurial orientation (EO) was buffeted as a concept by Miller (1983) and has been described as that underlying activity or behaviour of a firm that has the capability to rejuvenate it in a way that it can endure external events and shocks, or outperform its competitors (Avlonitis &

Salavou, 2007; Covin & Lumpkin, 2011; Wales, 2016; Mkalama et al., 2018). EO is a multidimensional construct made up of pro-activeness, innovativeness risk taking (Miller, 1983; Covin & Slewin, 1989), competitive aggressiveness and autonomy (Lumpkin & Dess, 1996; George & Marino, 2011). The composite qualities of the construct are summarized in Table 4.1.

Table 1.1: Construct of Entrepreneurial Orientation

Basic Dimension	**Composite Qualities**
Proactiveness	- forecasting imminent market changes
	- prospect creation vs. prospect identification
Innovativeness	- openness to new ideas
	- method and outcome creativity
	- search of original or new solutions
Risk Taking	- choices in ambiguity
	- execution of tasks necessitating substantial probabilities of expensive failure
Competitive	- economical benefit over competitors
Aggressiveness	- forceful posturing compared to competitors
Autonomy	- self-determining human undertakings
	- self-operating

Source: Adapted from (Ruiz-Ortega et al, 2013; Wach, 2015)

As shown in Table 1.1, proactiveness is viewed as the capability to predict the future and make decisions that are consistent with the future in the business output and can be either before or after the innovation. A firm is said to be proactive if it can anticipate and take action on new opportunities in either emerging markets, or new products (Rauch, Wiklund, Lumpkin, & Frese, 2009). Proactive firms frequently review their operating environment, regularly identifying and recognizing their opportunities (Wiklund & Shepherd, 2005). They make use of their first mover advantage status and as a result of this create an ability to charge premium prices (Covin & Slewin, 1989; Wiklund & Shepherd, 2005).

In a dynamic environment, innovation has gathered impetus to such an extent that firms run the risk of being anachronistic, if they do not innovate to adapt to this or future changes (du Preez & Louw, 2008). The characteristics of innovation include openness to new ideas, new products development, emphasis on research and development functions, corporate re-organisations (Miller,1983; Covin & Slewin, 1989; Wiklund & Shepherd, 2005).

Risk taking involves commitment of scarce resources in pursuit of uncertain outcomes (Rauch et al., 2009). Firms are said to be risk takers if they demonstrate a proclivity for undertaking new and uncertain projects, have a robust process to handle and deal with risk management, and have a reward for extraordinary action (Miller, 1983; Wiklund & Shepherd, 2005).

Competitor aggression can be said to be the demonstrated alertness to competitor activity, a behaviour of a firm that robustly gives it an advantage over its competitors (Lumpkin & Dess, 1996). It has been observed that new technology might lead to multiple opportunities or be transferred as a value-add to other sectors (Nadja-Janoszka, 2012).

Autonomy is considered to be the ability to make a decision without undue influence from other interested parties and seeing all ideas through to fruition (Lumpkin & Dess, 1996; Wiklund & Shepherd, 2005). Smaller firms tend to demonstrate autonomy in their leadership as often the business owner will most likely have his way in making key decisions affecting the firm (Avlonitis & Salavou, 2007; Lumpkin, Cogliser, & Schneider, 2009; Soininen et al.,2012).

These dimensions were empirically found as significant across different sizes and complexities of firms (Miller, 1983). The influence of these dimensions varies depending on factors that may range from internal reasons to external factors (Lumpkin & Dess, 1996; Miller, 2011). Similarly, the different dimensions influence in different manners the competitive strategy, cost leadership and firm performance (Lechner & Gudmundsson, 2014).

EO has been accepted as a firm-level phenomenon (George and Marino, 2011; Andersen, Kreiser, Kuratko, Hornsby, & Eshima, 2015; Wach, 2015) that brings together all existing definitions and expectations of entrepreneurship and explains a tendency towards a behaviour that can be said to be a prerequisite for entrepreneurship (Callaghan & Venter, 2011; Wales, Gupta, & Mousa, 2013). Unfortunately, over time, the definition of this construct, its components, the relationship between and amongst the components as well as the theory around it, have not been consistent (Rauch et al., 2009; George & Marino, 2011; Covin & Wales, 2012; Ejdys, 2016). Notwithstanding this and the fact that this field has attracted numerous studies, there is a general lack of consensus on the precise definition of EO and the subsequent dependent variable indicators (Fatoki, 2012; Rauch, Wiklund, Lumpkin, & Frese, 2009; Okeyo, Gathungu, & K'Obonyo, 2014; Gathugu, Aiko, & Machuki, 2014).

Measurement of EO has evolved over time and was initially constructed as a configurational or formative model (Covin & Slevin, 1991; Wiklund & Shepherd, 2005; Andersen et.al, 2015). This model was generally expressed as;-

$$\eta = \sum_{i=1}^{n} \gamma_i x_i + \zeta$$

where the sum of dimensions, x collectively explains or makes up the concept - entrepreneurial orientation (η), and changes in the dimensions (γ), induce changes in EO (η). In this case, the disturbance term (ζ), signifies the amount of difference not accounted for by dimensions (Andersen et al., 2015). In this model, EO is made up of a collection of changes in the various dimensions that make up EO.

The discourse on measurement models subsequently developed towards reflective models (Wiklund & Shepherd, 2005; George & Marino, 2011; Covin & Wales, 2012). In the reflective model, the EO as a construct is generally expressed as; -

$$x_i = \lambda_i \xi + \delta_i$$

Where x_i is the i-th indicator of exogenous dimension (ξ) affecting entrepreneurial orientation, λ is the loading factor of the dimension; with δ being the measurement error (Andersen et al., 2015).

There is also incomplete discussion amongst scholars as to whether EO is primarily a behavioural phenomenon or a representation of attitudinal, rational, or personality characteristic among decision makers in firms (George & Marino, 2011; Covin & Wales, 2012; Andersen et al., 2015). Emerging reseach, however, shows that reflective models may be uncessesarily limiting or result in biased (Type II error) conclusions (Mackenzie, Podsakoff, & Podsakoff, 2011; Andersen et al., 2015).

The most commonly used measure for the dimensions of entrepreneurial orientation is the Miller, Covin and Slewin (1989) Entrepreneurial Orientation Scale (Lumpkin & Dess, 1996; Lumpkin et al., 2009). Some studies have also defined *ENTRESCALE* as a measurement of EO in firms (Covin & Slevin, 1989; Knight, 1997). This scale has, however, not been robustly used and its application is thus fairly limited.

In spite all the current research outcomes, EO still holds promises for future theory development on entrepreneurship (Rauch et al., 2009). The discourse is still ongoing on whether or not additional dimensions or a reduction of the current dimensions of EO is suitable (Miller, 2011). In addition to the interactions amongst the EO dimensions, there are other internal and external factors that ultimately affect its efficacy and for which there are ongoing conversations on their influence (Miller, 2011; Ruiz-Ortega et al., 2013; Khayyat & Lee, 2015; Ejdys, 2016; Poudel, Carter, & Lonial, 2019).

1.1.2 Technological Capability

In this study, technological capability (TC) was treated as a firm level construct. Recent studies have defined TC as the ability in a firm to absorb and utilize technological knowledge and create new knowledge (Kang, Baek, & Lee, 2017; Radzi, Shamsuddin , & Wahab, 2017; Poudel et al., 2019). Due to the latency involved, technological ccapability is explained as an interior state of inclination to nurture innovation and includes various parameters (Bell & Pavitt, 1993; Arnold & Thuriaux, 1997; Acha, 2000; Iammarino, Piva, Vivarelli, & Von Tunzelmann, 2009; Zhou & Wu, 2010; Maria Alejandro & Pietrobelli, 2012; Jirayuth, Un Nabi, & Dornberger, 2013). This internal disposition is influenced by familiarity and talents of the employees; the size and maturity of the firm; the current overall strategy of the firm; available resources for the execution of its agenda; and the internal culture of the firm (Neely & Hii, 2012; Martinez-Roman & Romero, 2017; Solis-Quinteros, Avila-Lopez, Carrilo-Gutierez, & Arredondo-Soto, 2018). In this study, these organisational nuances have been described as the technological capabilities of the firm.

Science and technology have been shown to have a direct relationship with innovation in many countries (Khayyat & Lee, 2015). The fact that a particular technology exists does not necessarily mean that it can be easily applied or shared across firms (Maria Alejandro & Pietrobelli, 2012; Tubbs, 2013; Poudel et al., 2019). Some of the factors that enable the adoption of technology include economic incentives, dedicated internal resources, technical and organizational competence (Vonartas & Xue, 1997; Arnold & Thuriaux, 1997).

At the firm level, there is a strong mutual correlation between technology, innovation and other activities. A formal technology strategy forms a fundamental part of a firm's strategic positioning. The impact of TC will always have a lagged effect and will rarely occur instantaneously (Coombs & Bierly III, 2006). It is the diffusion of the innovation rather than the straight design of the innovation that delivers economic benefit of new technology (Rogers, 1995; Arnold & Thuriaux, 1997).

Arnold and Thuriaux (1997) recognised three crucial elements of TC as strategic capability, internal capability and external capability. These were established to be co-dependent and intertwined and afterwards led to a dynamic learning. These were developed on the basis of previous literature review, thereby plugging an apparent gap in a holistic discussion about technological capability. The three elements from the study of Arnold and Thuriaux are shown in Figure 1.1.

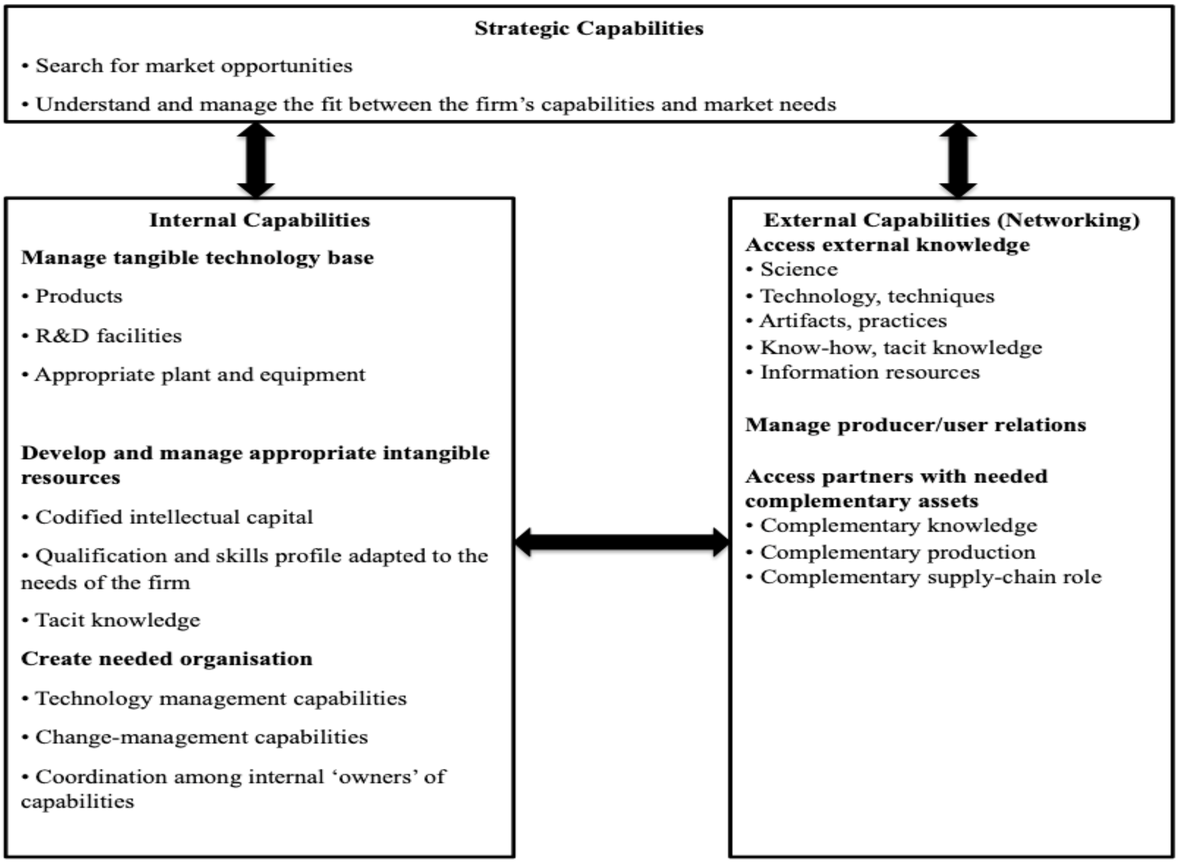

Figure 1.1: Key Elements of Technological Capability
Source: Arnold & Thuriaux's (1997)

As observed in Figure 1.1, the internal and external element interact and create a strategic competitive advantage for the firm. However, the three elements relate to one another differently depending on distinct firm situations. The internal capabilities were concentrated round the real and subtle resources that a firm held. The external capabilities revolved around the available knowledge on the business, networking activities and alliance provisions amid the firm and its business associates in addition to customer responses. The strategic proficiencies were oriented more to the market and businesses recognised opportunities and made efforts to join the gap between the market needs and levels of competence. There is overwhelming evidence that a significant amount of knowledge used in innovation is derived from external sources and part of the internal knowledge is intrinsically held by individuals (Arnold & Thuriaux, 1997). TC is limited on the basis of the resources accessible to the SME firm and is related to the peculiar determination of the owner-manager (Arnold & Thuriaux, 1997).

Subsequently, additional scholarly work categorized technological capability into three distinctive levels: technological acquiring capability, technological operating capability, and technological upgrading capability (Guifu and Hongfu, 2009; Jirayuth, Un Nabi, & Dornberger, 2013). Technological acquiring capability referred to the abilities to attain novel knowledge through formal, unofficial, inner and peripheral channels. It involved collaborating with other recognized and non-formal institutions who included customers and suppliers to develop technologies. Technological operating capability referred to capabilities to start, use and maintain production equipments and facilities. This included having skilled and experienced workers as well as making use of advanced technologies in a sustained manner. Technological upgrading capability concerned capabilities that greatly improved upon products and processes as a result of the firm's own strength and on changing market demands. This required that the firm consistently made changes to the production process and products (Jirayuth, Un Nabi, & Dornberger, 2013).

TC is determined by investment, production and linkages amidst different contributions by separately of these components to the final outcome of TC (Alejandra, 2009). Investment Capability is the quantity, inclination and ability to offer funds for investment in technological change. Production capability, on the other hand, is the ability to exhibit mastery or proficiency over essential technology that is necessary to make an enhancement. Linkage Capability signifies the ability to diffuse and gather information related to technology from other stakeholders. Additionally, the firms need to be able to network and yardstick as applicable (Laforet, 2011). There nevertheless are concerns that limited availability of this information has led to a proliferation of rent-seeking driven rather than innovation-driven business opportunities (Lafuente, Acs, & Szerb, 2018).

Although there is generally no consensus on the measurement index to use, it is generally accepted that a good measure of TC must include measurements on patent and published information, science and knowledge management and diffusion, funds dedicated to innovation, skills availability for innovation and level of utilisation of information technology (Bell & Pavitt, 1993; Vonartas & Xue, 1997; Acha, 2000; DeSarbo, Di Benedetto, Song, & Sinha, 2005; Coombs & Bierly III, 2006; Khayyat & Lee, 2015; Poudel et al., 2019). Being an intangible asset, TC has to be measured through proxies, which include financial resources dedicated to research, differing management attitude, internal organisational phenomena and behaviour towards innovation and appreciation of change, measure of current impact or absorption capacity of the technology or even an existing pool of ground-breaking knowledge reservoir, rights or licenses or networks available to the firm (Bell & Pavitt, 1993; Vonartas & Xue, 1997; Acha, 2000; DeSarbo, Di Benedetto, Song, & Sinha, 2005; Coombs & Bierly III, 2006; Renko et al., 2009; Maria Alejandro & Pietrobelli, 2012; Poudel et al., 2019).

Even though the function of technological capability in the performance and growth of SMEs has been well defined (Radzi et al., 2017; Lafuente et al., 2018), its influence on entrepreneurial orientation and its ultimate outcome on firm innovativeness remains largely not conceptualised (Maria Alejandro & Pietrobelli, 2012; Jirayuth et al., 2013; Solis-Quinteros et al., 2018; Poudel et al, 2019). This is a potential future research area.

1.1.3 Environmental Dynamism

ED is one of the measures of environmental turbulence concept that indicates an instantaneous outcome of change, uncertainty and a level of unexpected directionality of manifestations (Volberda & van Bruggen, 1997). There measures have been further individually bifurcated into two sub-dimensions as shown in Figure 1.2.

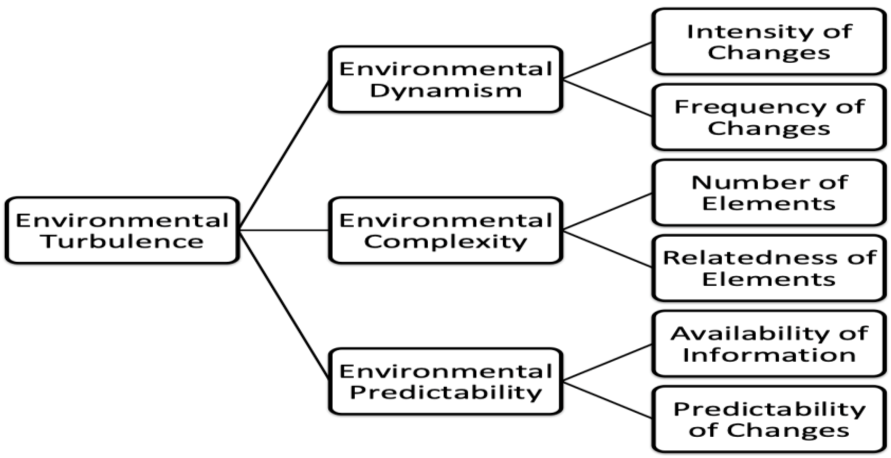

Figure 1.2: Dimensions of Environmental Turbulence
Source: Volberda & Van Bruggen (1997)

As per Figure 1.2, each of the three dimensions are split into two. Environmental dynamism is described by either its intensity or frequency of the environmental changes (Volberda & van Bruggen, 1997; Wijbenga & van Witteloostuijn, 2007). Environmental complexity is made up of a count or similarity of the elements (Volberda & van Bruggen, 1997). Finally, environmental predictability is made up of availability of information and predictability of the changes (Volberda & van Bruggen, 1997). Environmental predictability is also known as environmental munificence or hostility (Magaji, Baba, & Entebang, 2017).

Environmental Dynamism (ED) which may be either static or dynamic depending on the aspects being considered, is explained as the variation of the peripheral environments under which firms operate (Volberda & van Bruggen, 1997; Wijbenga & van Witteloostuijn, 2007; Jansen, Vera, & Crossan, 2009). A evaluation of literature shows that most of the studies measure the dimensions of ED singly rather than as multiple dimensions of either intensity or rate of change (AL-Nuiami, Idris, AL-Feroukh, & Joma, 2014).

ED influences the external circumstances under which a firm operates and these may change from time to time and are likely to have an impact on both the internal and peripheral practices of the firm (Covin & Slewin, 1991; Ruiz-Ortega, Parra-Requena, Rodrigo-Alarcon, & Garcia-Villaverde, 2013). Dynamic events such as medical pandemics may happen virtually overnight leaving business viability in jeopardy, or the dynamism may build up slowly such as the use of technology, but once a critical mass is reached, it can have sweeping impacts on how the affected firms survive. ED compels firms to be original in their products and tactics in the markets (Zhou, 2006). ED might also cause alterations to consumer tastes and preferences, leading to new product changes (Wijbenga & van Witteloostuijn, 2007).

Depending with circumstances that are pertinent to the organisation, ED triggers either an offensive or consolidation strategy (Miller & Friesian, 1983; Priem, Rasheed, & Kotulic, 1995). Changing demographics followed by different perceptions and inclinations, the transformational information technology capabilities, globalisation of competition have anticipated that SMEs have to continually review their internal strategic posture thereby affecting the way they do business (Lumpkin & Dess, 2001; Chryssochoidis, 2003;

Martins & Terblanche, 2003; Ngugi et al., 2013; Ruiz-Ortega, et al. 2013). ED makes firm owners to experience uncertainty in management, leading to a series of psychological responses that may include seeking more comprehensive information (Dess & Beard, 1984). An external dynamic environment requires firms to have the capacity to adjust accordingly so as to effectively react to variations in customer needs, adopt requisite technological changes as well as respond to adverse competition (Jiao, Alon, Kwong, & Chui, 2013). ED influences the strategies chosen by the firms and subdues the interactions between the organisational configuration, strategic posture and firm performance (Miles, Covin, & Heeley, 2000)

The most commonly used measure for ED is the multi-item scale of Miller, a Likert-type scale that has been frequently used in the strategy literature (Miller & Friesian, 1983; Miller, 1987; Miller and Droge, 1986; Garg, Walters, & Priem, 2003). In this scale, an assessment is made using bi-polar statements of key elements that include impulsiveness of customers and rivals, rate of change of market needs, industry innovation as well as level of investment in research and development. Conflicting statements are made and an assessment is made on a Likert-type scale by the respondent.

An alternative multi-dimensional measurement index for ED that uses longitutidinal statistical methods exists (Sharfman & Dean, 1991; Ensley, Pearce, & Hmieleski, 2006). In this case, macroeconomic indicators that include measures of changes over time in industry revenue, number of establishment indices, number of workers, outlay in research and development are analysed using regression analysis, thereby composing an index on instability. Each measure represents the criterion and time represents the predictor. Sharfman & Dean, 1991 subsequently developed a formula that combined these indices into a measurement for ED.

$$\delta = \zeta(MI + NEI + NESTI) + \zeta(TI) + \theta$$

where δ = Environmental Dynamism; ζ = Z Scores; MI =Market Instability; NEI = Number of Employees Instability; $NESTI$ = Number of Establishments Instability; TI = Technological Instability; θ = time span over which the instability data is measured.

This model has also been tried out by other empirical researchers but the results have been inconclusive (Ensley, Pearce, & Hmieleski, 2006). Additional measurement models have included the Khandwalla Methodology whose focus was on environmental uncertainly and technological changes (Panwar, Nybakk, Pinkse, & Hansen, 2015). In this case, the respondents evaluated whether the external environment was safe, risky, hostile, and predictable on a series of 3 item bipolar scale. In addition, there was a measure on whether there were any regulatory and technology changes affecting the industry (De Hoogh, et al., 2004). The Paswan-Dant-Lunt Methodology which was a set of scales that were specific to environmental dynamism had nine measures with each set of three measuring change and frequency in industry, competitors and consumers (Akgun, Keskin, & Byren, 2008).

Previous studies have shown that the external or environmental factors that affect firm innovativeness include local culture around the area of business operation and the associated environmental dynamism, munificence, complexity as well as unique industry characteristics (Renko, Carsud, & Brannback, 2009; Neely & Hii, 2012). The discourse by scholars on the influence of environmental dynamism on firm innovativeness whether singly or jointly with other variables is still ongoing (Ruiz-Ortega et al., 2013; Martinez-Roman & Romero, 2017).

1.1.4 Firm Innovativeness

There is no convergence of knowledge on the source of innovation in firms with views ranging from conscious effort to simple chance (Gilbert, 2007; Bereciartua, 2012). In a seminal article, Drucker (1985) argued that innovation comes about as a result of a conscious search of the innovation opportunities available in a limited number of situations. He went on to qualify that the four focus areas included unforeseen occurrences; inconsistencies; process requirements and industry and market changes. These focus areas existed within a company or industry. There were three additional areas that were external to the firm and these included demographic variations in discernment and new knowledge (Drucker, 1985). All these areas interacted with one another differently, leading to the need for additional research.

Innovativeness was previously defined “as the degree to which individuals accept new ideas relatively earlier than others in a social system” (Rogers & Havens, 1962), but this has since evolved over time. Innovativeness has also been defined as a continuous process that includes the level and potential that creates a new product, service or process that will be commercialised to allow an economic or social impact (Doroodian, Ab Rahman, Kamarulzaman, & Muhamad, 2014; Neely & Hii, 2012; Hult, Hurley, & Knight, 2004; Gilbert, 2007). Other scholars considered innovativeness as the state of organisation or firm’s culture that prevails and allows it to have a capacity to innovate (Hurley & Hult, 1998). In this earlier treatment, factors like market focus; emphasis on learning and skills; participative decision making and leadership style; communication; support and collaboration to the staff from firm owners; and power sharing at the top management levels, were essential for a firm to be innovative. Innovative capacity subsequently embraced a firm's disposition to modify itself and apply novel ideas, processes and products. Innovation capability was subsequently viewed as a specific internal resource within the firm (Romijin & Abaladejo, 2002).

Lawson (2001) tried to differentiate between innovative capability and innovativeness, arguing that innovative capability was a blend of internal and external factors that make the firm able to innovate. On the other hand, Lawson argued that innovativeness was internal to the organisation and therefore made the firm owners to have considerable leverage over it.

In this study, firm innovativeness has been used and considered interchangeably with firm–level innovative capacity. Distinct from innovation, which is an output, innovativeness is cognised as that constant latent process that forms a new product, service or process that will be subsequently commercialised to generate an economic or social impact (Doroodian et al., 2014; Neely & Hii, 2012). The construct also provides insights into the potential of technology in specific areas or locations as well as assessment indicators to appreciate changes in potential technology (Lawson, 2001; Suarez-Villa, 2007). Innovativeness allows prioritisation of investment as well as measurement and standardisation of patent data (Suarez-Villa, 2007) bearing in mind that research and experimentation are generally expensive and a trade-off has to be made.

Innovation patterns have also been shown to vary from country to country, city to city as well as sector (Cornel University, INSEAD and WIPO, 2016; Lee & Rodriguez-Pose, 2013; Leger & Swaminathan, 2007). There are ongoing divergent conversations about differences in levels of innovations amongst different entities, some of which are within the same environment and industry (Neely & Hii, 2012). The thrust of the discourse is what really drives the innovativeness of entities. This is against the backdrop that whereas research and experimentation to achieve innovation is very expensive, there's a need to appreciate changes in potential technology and as such trade-offs have to be made (Suarez-Villa, 2007). Although not categorically determined, some scholars have suggested that larger cities offer a distinct ecosystem for innovation as they are endowed with a higher concentration of customers, suppliers and employees (Lee & Rodriguez-Pose, 2013).

Innovativeness has been extensively studied by scholars and has been conceptualised as the manner through which an entity changes its operating processes or service, craft different or modified products in the markets, with an intention of realising efficient and effective processes that eventually leads to greater margins and growth (Oscarsson, 2003; Damanpour & Wischenevsky, 2006; du Preez & Louw, 2008; Perez-Luno, Wiklund, & Cabrera, 2010). It is commonly agreed that innovativeness is affected by both internal and external factors and largely depends on how the firm owners react to an external or internal set of stimuli (Lawson, 2001; Hult, Hurley, & Knight, 2004). There is little convergence on the factors that cause and affect innovativeness (Hult et al., 2004), but there is a common agreement that environmental and structural rather than individual characteristics play a substantial role in determining firm innovativeness (Ruiz-Ortega et al., 2013; Martinez-Roman & Romero, 2017 (Radzi et al., 2017; Lafuente et al., 2018).

The Romijn and Albaladejo's model summarises the dimensions that affect firm-level innovative capacity or firm innovativeness as presented in Figure 1.3.

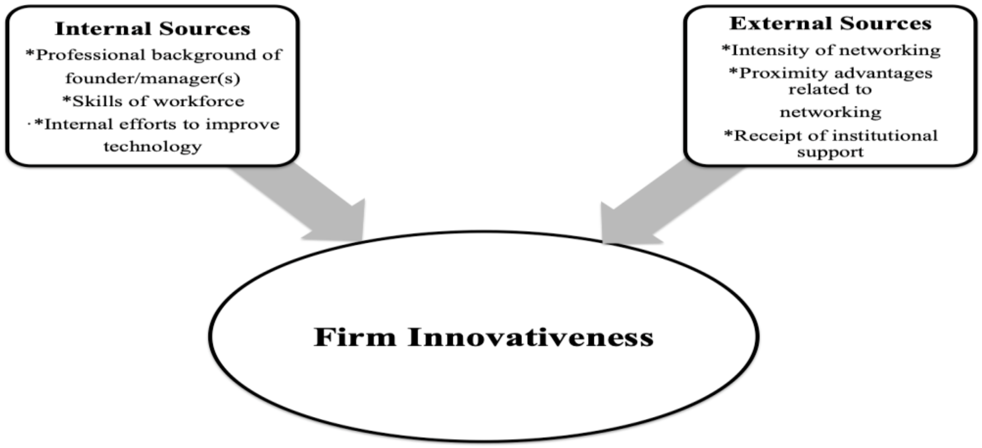

Figure 1.3: Dimensions of Firm Innovativeness
Source: Romijn & Albaladejo's (2002)

Figure 1.3 shows that firm innovativeness is affected by both internal and external sources. Internal sources exist inherently within the firm and include the professional background, skills and experience of the founder or their managers. Internal sources also include the skills of the workers as well as the internal efforts to improve on the technology of the firm (Romijn & Albaladejo, 2002). External sources have a variety of trigger sources that include the intensity and efforts made in networking. In addition to this, there are the proximity and advantages of related to networking. Finally, the influence of external institutional linkages and support to the firm also affect firm innovativeness (Romijn & Albaladejo, 2002).

The most commonly accepted indicators of innovation and innovativeness, include the number and types of new products and services as well as the amount spent on research and development. (OECD, 2005; Massa & Testa, 2008; Perez-Luno & Blasco, 2015). Other indicators include specialised skills of staff, number of licences, patents and trademarks generated as a result of the activity, information distributed in literature, the entire amount of sales of original products, the number of innovations, and even the increase in revenue and market share as a result of new products (Massa & Testa, 2008). There is however, some considerable difficulty in standardising and quantifying innovativeness in a statistical and quantitative manner (Romijin & Abaladejo, 2002). A variant of the Miller and Friesian, 1983 Scale is also commonly used to measure innovativeness (Miller & Friesian, 1983; Massa & Testa, 2008) whereby, a set of paired statements with a multi-item scale are made to the respondent, who then chooses what is closest to their situation.

Bearing in mind the fact that in some cases, assessments are made on the basis of self - assessments and the informants may not be sincere with all their data (Khan & Manopichetwattana, 1989), and due to the diversity on the indicators of innovativeness, it is important that an objective study has a broad-based measurement tool of these indicators. In this respect, it is common to find self-assessed data by entrepreneurs occasionally being misaligned from the official data, which are often derived on the basis of traditional innovation indicators (Podsakoff, Mackenzie, Lee, & Podsakoff, 2003). As an example, some of the proponents of the non-traditional measures of innovativeness argue that innovation indicators for SMEs are rarely recognised in the financial statements and would like to see them as intangible assets (Massa & Testa, 2008).

1.1.5 Small and Medium Manufacturing Enterprises in Kenya

Studies have connected the improvement of global economies to the development of the SME sectors, which on average, account for between 3%-50% of the gross national products for the emerging economies (Ayyagan, Beck, & Demirgue-Kunt, 2007; Ardic, Mylenko, & Saltane, 2011; KNBS, 2016; Muriithi, 2017). SMEs also contribute substantially to the number of firms and employees in Africa (Muriithi, 2017; Ndemo & Mkalama, 2018). In Kenya, SMEs account for over 33% of the GDP and employ well over 80% of the labour force (KNBS, 2016; Bor, 2018). It has also been established that the greater the value of SME output, the more advanced an economy is, because SMEs generally stimulate wealth creation by causing additional goods, investments flows, job creation, as well as consumption (O'Regan & Ghobadian, 2005; Gilbert, 2007; Muriithi, 2017).

A myriad of reasons has been identified as being part of the challenges for the growth of SMEs. They include access to financing; inadequate management and technical skills; unfavourable external and regulatory systems; inconsistent information; poor infrastructural access (KIPPRA, 2017; Muriithi, 2017). Kenyan SMEs are also greatly dependent on self-financing and often informal institutional arrangements (Muriithi, 2017). There have been numerous conscious policy efforts and intervention on the part of the government towards invention, but inadequate exertion in addressing diffusion (Arnold & Thuriaux, 1997).

SMEs have also been renowned for introducing, incubating, propagating, and commercialising new ideas (Muriithi, 2017). Due to the extent of broadness of information requirements, there is limited consensus on the causes of firm innovativeness on SMEs at a global level (Ayyagan et al., 2007; Ardic et al., 2011). It is, nevertheless appreciated that to understand EO and firm innovativeness within SMEs, it is necessary to study it separately as distinct to doing it from the context of a large organisation (McAdam, Keogh, Reid, & Mitchell, 2007). It is also generally accepted that unfavourable policy descriptions can affect the innovativeness and subsequent performance of SMEs (Vanhaverbeke, Vermeersch, & DeZutter, 2012). In addition to this, there is a need to understand the internal and external factors that affect the relationship between EO and innovativeness in manufacturing SMEs in Kenya.

There is no consensus on the definition of SMEs, and different countries and players have defined it differently (OECD, 1996; Ayyagan, Beck, & Demirgue-Kunt, 2007; Radas & Bozic, 2009; Muriithi, 2017; Tambunan, Ndemo, & Mkalama, 2018). Whereas we appreciate that the employee-based definition is not a perfect one, the complementarity of data that was available by the local baseline study (KNBS, 2016) substituted the need to consider other near-perfect definitions for which there may have been no data available, thus limiting the study to firms that employ less than 100 employees. The study also considered the firm's annualised sales turnover and thus firms that had turnover of between 500,000 and one billion Kenyan shillings were considered as fitting within the study SME category. This was previously successfully used for comparative studies (Berg, Fuchs, Ramrattan, Totolo, & Wagh, 2015). With over 7.4 million MSMEs, as of 2015, the SME segment had engaged 14.9 million individuals, which was well over 50% of the number of individuals employed by the economy (KNBS, 2016).

Manufacturing is often ranked among the top three production sectors in Kenya (KNBS, 2016). The study adopted the definition of KNBS 2016 of the manufacturing sector as those entities that engage in physical activities or processes that add value to a product or raw material (KNBS, 2016). Over the previous 11 years, the overall manufacturing sector contributed a stagnant 11% of Kenya income (GOK, 2015), and has been on a downward spiral with a sectoral GDP growth rate of 0.2% in 2017 (World Bank Group, 2018). This was not considered as adequate to address the underlying problems of economic growth.

A study by African Development Bank (AfDB) averred that the manufacturing sector's contribution to GDP and employment across East Africa is minor compared to other territories (AfDB, 2018). It further argued that the sector's diversification is limited and associated with low technological development.

Consistent with the Growth Theory, it is evident that manufacturing rather than the agricultural sector leads economic growth (Chege, Ngui, & Kimuyu, 2014). Manufacturing was previously concentrated around the main urban areas of Nairobi and Mombasa (GOK, 2015), but with the new constitutional dispensation, it remains to be seen whether there will be an overflow of manufacturing to the other areas (Chege et al., 2014). The manufacturing SMEs also have a varied level of specialisation and most of their products are designed for low to medium income domestic consumption with some surplus for export to the neighbouring countries (Chege et al., 2014).

It is now appreciated that the manufacturing sector needs to undergo a transformational growth for it to achieve a long-term impact on the development of the country (GOK, 2015). At the national level, the gross production of the manufacturing SMEs still lags at less than 20% of value behind the larger enterprises even though they employ more people (more than 80%) than the larger firms (Chege et al, 2014, KIPPRA, 2017). Unfortunately, with the increased impact of globalisation of the economy, the impact of the manufacturing sector in Kenya and Africa, in general, is at a risk from the more competitive manufacturing industries of China, India and other fast industrialising nations (KIPPRA, 2017). This calls for diversification, enhanced productivity and efficiency in the sector.

1.2 Research Problem

Being cognizant that formulating an entrepreneurial research problem is often a function of many parameters (Sarasvathy, 2004), the study avers that there is adequate knowledge on the conceptualisation of the association between innovation and firm performance. Conversely, the antecedents of innovation as a key dimension of entrepreneurial orientation has not been effectively conceptualised (Hult et al., 2004; Avlonitis & Salavou, 2007; Perez-Luno, Wiklund, & Cabrera, 2010). The mediating action of technological capability on the association between entrepreneurial orientation and innovativeness has not been fully conceptualised (Zhou & Wu, 2010; Maria Alejandro & Pietrobelli, 2012; Jirayuth et al., 2013; Radzi et al., 2017; Lafuente et al., 2018; Solis-Quinteros et al., 2018). Neither has the moderating action of environmental turbulence similarly been exhaustively conceptualised (Ruiz-Ortega et al., 2013; Martinez-Roman & Romero, 2017). The focus of most of the reviewed studies has mostly been on independent variable and its effect performance, hence a gap in the aspect of antecedent variable and its connected impact on innovativeness. Conceptually, these areas have been identified to have knowledge gaps, thereby making a compelling need to further study these relationships.

Whereas it is appreciated that not many of the new firms are entirely innovative, but rather, rely on available market opportunity, it is similarly argued that entrepreneurship is broadly accepted as a societal phenomenon and therefore, many people often make attempts at being entrepreneurs (Lafuente et al, 2018). The mortality rate for SMEs in Kenya remains high, as almost 46% of the firms do not survive beyond one year of their operation (KNBS, 2016).

One of the reasons for inhibition of growth of SMEs in Kenya has been identified as lack of innovation (KNBS, 2016; KIPPRA, 2017) and this is consistent with the Schumpeterian Theory on Creative Destruction, which argues that without innovation, firms have a reduced likelihood of survival (du Preez & Louw, 2008). SMEs operate under very restrictive internal circumstances mainly due to the limited resources leading to the limited available technological capability. An SME may have the best ideas and feedback collation from customers, but until such a time that the capability is suitable, no innovation will be observed (Fatoki, 2012; Njiraini, Gachanja, & Omolo, 2018). The flip side of this argument is that limitation of resources and other challenges creates innovativeness on the basis of the resources held (Radas & Bozic, 2009). SMEs operate under turbulent environments and are under constant pressure to innovate in either product, process or service. The impact of the prevalent innovation ecosystems is also an area that is often ignored (Ndemo, 2015). Continually, a cocktail of intra-firm actions coupled with a plethora of external institutional reforms to address poor productivity in manufacturing SMEs were instituted, but to no much avail (GOK, 2005; GOK, 2013; GOK, 2015). The need for additional research to identify the reason and details of these additional external factors stood out, creating a need for additional research.

Over the past 10 years and in spite of the phenomenal growth around the world, innovative activity which was mostly product innovation in Kenya had plateaued (Kiveu, 2012; KNBS, 2016 WIPO, 2016; KAM, 2019; KIPI, 2019). Suffice to say, this incommodious phenomenon saw varying conclusions on studies on entrepreneurial orientation in SMEs in Kenya and specifically in Nairobi (Migiro, 2005; Okeyo, 2014; Mwangi & Gachunga, 2014). Studies showed that the productivity of manufacturing

SMEs in Kenya was generally low and declining in trend (Cusolito & Cirera, 2016). The low productivity was attributed to various factors, which included infrastructure and limited automation (KIPPRA, 2017). Ironically, Kenya was a net exporter of many agro-based raw materials, but not a net importer of many refined agro-based products for which local industries existed, but were uncompetitive (GOK, 2015). Only an increase in firm productivity could make Kenyan firms globally competitive (Cusolito & Cirera, 2016) and change the tide in its favour.

More than 35% of the manufacturing activities in SMEs take place in Nairobi (KNBS, 2016), and being the commercial and political capital city of Kenya, it can be argued that to a large extent factors affecting business in the city would affect the rest of the country. There are glaring gaps in understanding firm-level innovativeness as the dependent variable in the country (Houthoofd & Hendrickx, 2012). How much of the available knowledge is specific to SMEs? Moreover, due to the complexity of information requirements for SMEs (Khayyat & Lee, 2015), conceptualization has not been consistent.

In addition, diffusion and commercialisation of innovation faced challenges (Arnold & Thuriaux, 1997). A review of the KIPI data on patents (See Appendix IV) suggested that only 4% of the patents applied for by Kenyan residents were registered in 2018. On the other hand, at the ARIPO office, 35% of all the grants that were designated to Kenya, were approved. Utility model applications for Kenyan residents also had a low registration rate of 18% in 2018. A review of the Global Innovation Indicators showed that countries such as China have over time increased the quantities of intellectual protection within their borders and this was also reflected by the level of subsequent innovation observed in the country (Cornel University, INSEAD and WIPO, 2016; Global Entrepreneurship Monitor, 2016). Although, Kiveu, 2012, attributed the low number of applications of patents and grants to the handling of the applications the data suggested a need to establish the underlying reasons for the low approval rate of the patents and utility models. This is in spite of the general awareness of the importance of patents and trademarks. What are these factors that hold back the process?

Most of the studies conducted have been methodologically weak on the basis of either inadequate or biased samples (Neely & Hii, 2012; Ruiz-Ortega et al., 2013). Others have had limited timeframes, being cross-sectional in nature and, therefore, not being able to adequately capture all the required phenomena (Renko et al., 2009). Other studies on SMEs have either indicated respondent biases (Ruiz-Ortega et al., 2013) or lacked universal geographical validity (Radas & Bozic, 2009).

Literature review showed that conversation on factors that affect innovativeness in SMEs was still ongoing (Heimonen, 2012; Neely & Hii, 2012; Ejdys, 2016; Martinez-Roman & Romero, 2017). Furthermore, studies indicated that a compelling question that needed to be answered was the consequence of internal and external factors on the innovativeness of manufacturing SMEs (Renko et al., 2009 (Heimonen, 2012).

To address the highlighted contradictions and gaps, the study was directed by the following questions: How do the internal and external factors that affect firm innovativeness? What is the effect of entrepreneurial orientation, environmental dynamism and technological capability on the innovativeness of manufacturing SMEs in Nairobi, Kenya?

1.3 Research Objectives

This study sought to establish, analyse and determine the effect of entrepreneurial orientation, technological capability and environmental dynamism on firm innovativeness within manufacturing SMEs in Nairobi County. Specifically, it had the following objectives; -

i. To establish the relationship between entrepreneurial orientation and firm innovativeness of manufacturing SMEs in Nairobi;
ii. To assess the mediating effect of technological capability on the relationship between entrepreneurial orientation and firm innovativeness of manufacturing SMEs in Nairobi;
iii. To determine the moderating effect of environmental dynamism on the relationship between entrepreneurial orientation and firm innovativeness of manufacturing SMEs in Nairobi;
iv. To establish the joint effect of entrepreneurial orientation, environmental dynamism, and technological capability on firm innovativeness of manufacturing SMEs in Nairobi.

1.4 Value of the Study

This study has value in several ways. One uniqueness of this study is that it is a shift away from the common pairing of studies on entrepreneurial orientation against performance of firms. The study advances the existing knowledge on the antecedents of innovativeness in manufacturing SME firms. It also contributes to the otherwise divergent views across the concept of innovativeness. It will also add to the existing theory and specifically complement the anchoring theories. The study focus on Kenyan SME context so as to widen the universal validity of the previous empirical studies that have been carried out on the same subject.

In addition, the study seeks to boost the practitioners in the SME world. An understanding of the antecedents of innovativeness in manufacturing SMEs contributes to increased productivity of the practitioners in the SME world. When applied across the board, this knowledge is of benefit to all individuals in the SME world and more specifically the local manufacturing sector.

Finally, the study is meant to add to the available options of the policy makers. It also allows policy decisions that are knowledge-based. Entrepreneurship contributes to economic development and every institution that has a role in economic development would as a matter of fact be concerned as a stakeholder, to ensure that the right levers are pressed so as to generate innovation and ultimately, a variety of new products, and services and finally, the growth of firms.

1.5 Organisation of the Thesis

The thesis is organised into seven chapters. Chapter One forms the introduction and covers both the conceptual and contextual background to the study. This chapter also discusses the contextual background by discussing the manufacturing small and medium enterprises in Kenya. After the conceptual and contextual discussion, the chapter next discusses the research problem and objectives before finally articulating the value of the study.

Chapter Two provides a literature review of the theoretical and empirical studies that have been carried out in the research area. It starts with a discussion on the theoretical foundations of the study. During this stage, the anchoring theories are discussed in detail.

The chapter next discusses the empirical research that has been done on the various variables identified in the study. Consequently, the gaps in knowledge are identified and tabulated. The conceptual framework and hypothesis are subsequently developed, presented and discussed.

Chapter Three is on the research methodology that was applied. In this chapter, the research philosophy will be articulated. Thereafter a research design will be proposed. The research population will be derived and subsequently sampling design discussed. Further to this, the data collection methods, the operationalisation of the research variables and response rates are presented and articulated. In addition to this, the confirmatory tests on validity, reliability, normality and multicollinearity that were carried out are presented. Finally, the justification of the analytical techniques used in the study are discussed.

Chapter Four is a preliminary presentation of the findings that were obtained predominantly from the questionnaire survey. Initially, the chapter presents the descriptive data of the quantitative findings. The chapter also focuses on the inferential statistics and presents the hypothesis tests of the objectives of the study. This is followed by a discussion on the derived results whilst comparing them to previous empirical research. Chapter Five provides the results of the qualitative research done by way of case studies. A detailed description of the profiles of the cases is provided followed by the narratives obtained by the case studies. A thematic analysis of the findings is also presented in this chapter.

Chapter Six is an aggregated discussion of the findings of the research. It reviews the findings from both the qualitative and quantitative research. Subsequently, a joint evaluation of the qualitative and quantitative data is made. Chapter Seven covers the summary and recommendations of the study. It also discusses the implications of the study for theory, entrepreneurial practices and policy. The chapter concludes by discussing some of the limitations experienced during the research, providing suggestions for further research.

1.6 Chapter Summary

Chapter One provides an introduction, with an extensive background and the *raison d'etre* for the study. The chapter dwells on the key and contemporary arguments for the conceptualisation of entrepreneurial orientation, technological capability, environmental dynamism and firm innovativeness with a specific focus on manufacturing SMEs. The chapter also provides the contextual background to manufacturing SMEs in Kenya. This finally leads to an elucidation of the research problem, thereafter defining the objective of the study. The chapter concludes by pronouncing the value of the study as a prelude to explaining the organisation of the thesis. The next chapter provides a literature review of the study.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

Chapter Two provides a literature review of the theoretical foundations, anchoring theories and empirical studies with respect to this study. It starts by discusses specific anchoring theories that this study has been anchored on. It thereafter discussed the empirical studies that have been done with respect to entrepreneurial orientation, environmental dynamism, technological capability and their effect on firm innovativeness. In the theoretical framework, the historical and theoretical debates around the various anchoring theories are discussed. The relationship between the theories and the various study variables is also established.

The chapter next delves into the empirical studies researched in the study variables. These are initially studied singly and thereafter synthesised with reference to the dependent variable. This allows an extraction of the knowledge gaps which is provided as a summary. Consequently, a study conceptual framework and conceptual model are proposed and presented in the study.

2.2 Theoretical Foundation of the Study

The following section discusses the theoretical foundations of the study. It highlights the underlying theories and subsequent models that are applicable in the study. It provides the genesis of the theory and applicable models. It also highlights the various theoretical developments and critiques of the various theories. It also outlines the application and suitability of the theory with respect to the variables of the study.

The study was anchored on five theories, namely the General Systems Theory and more specifically, the Open Innovation Model (OIM); the Diffusion of Innovation Theory (DOI); the Resource-Based View (RBV); the Industrial Organisation Theory (IOT), of which the Game Theory (GT), was prominent and the Institutional Theory of Organisations (ITO). Entrepreneurial orientation as a construct was anchored on OIM and DOI, whereas technological capability was anchored on RBV and IOT. Environmental Dynamism was anchored on the IOT and ITO.

2.2.1 General Systems Theory

The General Systems Theory (GST) was the overarching anchor theory of the study. GST was initially proposed as a concept in biology by Ludwig von Bertalanffy in 1920s (Bertalanffy, 1972; Forrest, 2018). Von Bertalanffy subsequently, developed the Aristotelian statement, ‘the whole is more than the sum of its parts’ and outlined the systems theory with known mathematical accounts of systems properties such as wholeness, sum, growth, competition, allometry, mechanization, centralization, finality, and equifinality (Bertalanffy, 1972). GST theorised that a system was set of interdependent entities that related amongst themselves and the environment in which they operated in (Bertalanffy, 1972).

According to Betalanffy, there were three realms of GST, namely systems science, technology, philosophy (Bertalanffy, 1972). Systems science – encompansed the scientific examination and theory of systems in the various sciences (Bertalanffy, 1972). Systems technology posited that advances of an all-inclusive or systems and generalist and interdisciplinary nature were necessary because modern technology and society had become too complex (Bertalanffy, 1972). This led to novel conceptions such as control and information theory, open innovation and game decision theory, among others (Bertalanffy, 1972). Finally, systems philosophy embraced the reorientation of thought and world view from the traditional "blind mechanistic laws of nature' to the modern view of the 'world as a great organisation' (Bertalanffy, 1972).

GST was considered as the creed of principles applying to all systems and demonstrated a cohesive interaction and interdependence of unique entities (Forrest, 2018). These entities were separately affected by their operating environments that define structure and functioning (Bertalanffy, 1972). In due course, discourse on GST continues to transcend across various discipline resulting in its application in various areas which includes Open Systems in business management (Scott & Davis, 2016; Tani, Papaluca, & Sasso, 2018). Open systems theory is the precursor to open innovation model.

2.2.2 Open Innovation Model

Popularised by Henry Chesbrough, this model appreciates the fact that knowledge carriers are many and are not stationary, thereby making it difficult for firms to retain proprietary rights over new ideas (Chesbrough, 2003). It was further observed that not all firms generate and make full use of their internally generated ideas (Ibrahim & Bong, 2017). In OIM, a firm made extensive use of both internal and external proprietary ideas, which were then accepted at all stages of the innovation development (Chesbrough, 2003).

The Open Innovation Model was further dyadically classified into the Partner Variety and the Phase Variety (Lazzarotti & Manzini, 2009). The Partner Variety relates to the number and type of external stakeholders with which the company works with in the innovation process (Lazzarotti & Manzini, 2009). The Phase Variety, on the other hand, relates to the number/type of stages or phases of the innovation process that the company exposes to external contributors (Lazzarotti & Manzini, 2009).

These varieties were further classified in a quadratic manner as follows: Closed innovators, who only allow specific external partners for specific phases of the research; the specialised collaborators, who allow many external partners for a limited range of phases; integrated collaborators, who allow a limited number of partners for many different phases of innovation collaboration and; open innovators, who allow many different partners for equally many different phases of collaboration (Lazzarotti & Manzini, 2009). These varieties have subsequently been characterised differently in terms of the level of integration, types and number of organisations involved and forms of governance therein (Lazzarotti & Manzini, 2009). Different firms have different kinds of regimes of integration and control depending with the complexity of the task at hand and the amount of resources available to the firm to pursue collaborative research.

OIM has however been criticised as having abridged the innovation process to linear sequences that were then iterated by external linkages and opinions (Trott & Hartmann, 2009; Benezech, 2012). There are also doubts on the universal legitimacy of the model for all types of organisations and the OIM has been criticised as having been modelled on large organisations with very little empirical work on SMEs (Lazzarotti & Manzini, 2009; Benezech, 2012). In addition, there are discussions on impacts of OIM on public policy, and more so on National Innovative Systems (Lazzarotti & Manzini, 2009). Along this line, it is argued that most extensive research on OIM has been on the more developed economies with limited validation in the developing world (Ibrahim & Bong, 2017). OIM's underlying assumptions have been criticised as being inconsistent, thereby leading to fragmented and incoherent deductions and consequently, practical inapplicability of the model (Lazzarotti & Manzini, 2009; Trott & Hartmann, 2009; Benezech, 2012; Ibrahim & Bong, 2017).

2.2.3 Diffusion of Innovation Theory

This behavioural theory was initially founded by Everret Rogers in 1962, and sought to explain in what way, why, and at what rate innovative notions and expertise spread (Rogers & Havens, 1962). Rogers posited that diffusion is initially influenced by the perception of a value in the innovation by the potential adopter (Rogers, 1995). It was also influenced by the existence of a communication channel or process about the innovation that allowed the adaptors to extensively discuss the innovation; Diffusion also requires time to allow the innovation to spread. The time required is a blended function of many variables. Finally, according to Rogers, a social system within which the potential adopters relate was also required.

In addition to this, for a person to adopt an innovation, they must go through a series of self-reflection steps that create awareness of the need for the innovation (Rogers & Havens, 1962). Rogers and Havens further posited that in the first step, the potential adopter has to be aware of the existence of a problem or need and the availability of a possible solution or an innovation to address the need. The potential adopter will then try out the solution, initially on a very small scale to determine whether or not it addresses the specific need. After this stage, the adopter will then make a determination as to whether to adopt (or reject) the innovation. In the event of a positive decision, the adopter will next verify the innovation and its subsequent uses thereby making a confirmation on the need to continue using the innovation (Rogers, 1995).

According to Rogers, when promoting an innovation, diverse strategies are used to charm the diverse adopter groups. The foremost stage comprises the innovators, venturesome people who are always interested in trying out new ideas. These people are very enthusiastic to take risks, and are frequently the first to advance new ideas. The second stage includes the early adopters. They are mostly opinion leaders, relish leadership roles, and clinch change opportunities. The third stage is made of the early majority, who though not leaders, embrace new ideas before the common person. They however, characteristically need to see a confirmation about the innovation before adopting it. The fourth group are the late majority, who mostly are cynical of change, and will only embrace an innovation after it has been tried out by the masses. The final group are the laggards. These are mostly comfortable with existent tradition and very conservative, being the most difficult group to deal with (Rogers, 1995).

DOI has been criticised for various reasons. The first critique is that it does not work well in non-behavioural sciences a case in point being that empirical research in medical and computer-related sciences has not been conclusive (Lyytinen, Damsgaard, Ardis, & Marcolin, 2001; Sahin, 2006; MacVaugh & Schiavone, 2010). It has also been criticised as working well with the acceptance of behaviours rather than cessation or deterrence of behaviour (Lyytinen et al., 2001). It has also been criticised as not taking into account the individual or environmental support system for the adoption of the new behaviour (Lyytinen et al., 2001). With open innovation, at hand, an innovation may mutate, thereby affecting the diffusion, which has similarly not been considered in this model. Finally, the theory has been criticised as being considered as a "one-way street", whereby innovation moves from the innovators to the laggards, whereas there are cases where the current laggards may actually become future innovators or early adopters (MacVaugh & Schiavone, 2010).

2.2.4 Resource-Based View

The Resource-Based View as articulated by Birger Wernerfelt in 1984, was derived from the initial seminal work of Penrose (1959). This view argues that a firm has a competitive advantage on the basis of internally available resources that are valuable, idiosyncratic to it, un-imitable and limited in nature (Wernerfelt, 1984; Barney, 1991). This view has been applied in various fields, ranging from social sciences to information systems (Priem & Butler, 2001).

RBV has been criticised as being inadequate on the basis of several grounds (Priem & Butler, 2001; Amstrong & Shimizu, 2007; Kraaijenbrinke, Spender, & Groen, 2010). The first critique was that there is no significant operational validity in RBV, arguing that it is superficial in description and does not prescribe for resource managers (Priem & Butler, 2001). According to Kraaijenbrinke et al., 2010, this critique was dismissed as being superfluous on the basis that RBV endeavours to explain the competitive advantage of a firm over others. Kraaijenbrinke et al further identified the second critique that stated that

RBV was equivalent to an endless search, a view which does really work against RBV. Kraaijenbrinke et al went on to propose the third critique of RBV as there being a limited applicability of its use. Accordingly, it was firstly argued that RBV as a general theory could not be valid when discussing "unique" resources. Secondly, it was argued that RBV only applied to large firms as the small ones were perceived not to have large outlays of resources. A further argument was that the resources that a firm had to generate the competitive advantage, were the same ones that the firm was struggling to acquire. Although these arguments have been dismissed as being "academic", this study opined that the applicability of RBV would remain the same in so far as the dynamic environments were concerned.

Kraaijenbrinke et al., 2010 further identified the fourth critique, being that a sustainable competitive advantage for firms was unattainable because competitors were not passive, but were also aggressively seeking innovative solutions to challenge this advantage. *Praeterea*, Kraaijenbrinke et al argued that RBV was premised on *ex post* sources. The fifth critique was that RBV was insufficient as a theory of the firm but served as complementary to other theories (Priem & Butler, 2001; Kraaijenbrinke et al., 2010). Scholars further argued that the four requirements for resources used to attain the sustainable competitive advantage of firms in the RBV arguments have not been fully empirically validated (Amstrong & Shimizu, 2007; Kraaijenbrinke et al., 2010).

Kraaijenbrinke et al., (2010) further postulated that there were important disparities about the types of markets, individuals, and resources and the roles these played in generating the competitive advantage. Resultingly, the non-recognition of the managerial competences as resources to recognise and exploit the productive opportunities was raised as a critique by Kraaijenbrinke et al. It has also been argued that it is difficult to determine the values for the resources, which are also considered as axiomatic in an effort to provide useful theory. RBV has been criticised as being unnecessarily tautological (Priem & Butler, 2001; Bains, 2001; Kraaijenbrinke et al., 2010). Finally, the conceptualisation of resources has been considered as unworkable, being considered as over-inclusive. On this basis, RBV has been considered as not recognising the differences between resources as inputs and resources that enable the organisation of such inputs. Further, it is argued that there is no distinction on how different forms of resources may affect a sustained competitive advantage in a distinctive way (Priem & Butler, 2001; Bains, 2001; Kraaijenbrinke et al., 2010).

2.2.5 Industrial Organisation Theory

The Industrial Organisation Theory builds on the traditional Theory of the Firm and there are several schools of thought (Conner, 1991). The emphasis of this paper will be on the Bain School, which developed the Structure-Conduct-Performance (SCP) Paradigm. This paradigm posited that the peripheral environment in which a firm operates affects its strategic approach. This strategy, in turn, affected the firm's behaviour leading to the SCP paradigm.

A market structure is determined by the extent of seller concentration, buyer concentration, product diversity and the conditions of entry and exit, to and from the market. The structure is further defined by whether there are many sellers and buyers, termed as the perfect market structure or a single seller and many buyers, leading to a monopoly situation. In between these two extremes, are the oligopoly structure, where there are few sellers and many buyers and the oligopsony, where there are few buyers and many sellers. The concentration of buyers and sellers is due to a high level of entry barriers that keep away any aspiring entrants to the markets.

A high degree of concentration may lead to distortions in quantities and prices by either of the parties involved. The market conduct is the series of activities that may include sales strategies, product innovation or even mergers and linkages of the firms to achieve their organisational goals in view of the immediate market structure. The result of the market conduct of the firm in response to the market structure leads to the performance of the firm, which is measured by various indices such as returns on equity, efficiency measures and even rates of technological advances.

Criticism of the SCP Paradigm included the point that the structure was also affected endogenously. The second criticism was that performance was affected by more than one variable, and finally, that predictions on this model were unstable. The third criticism was the weak assumption, especially that of perfect competition markets with homogenous products (Tung, Lin, & Wang, 2010). Moreover, this theory was limited by the fact that it only explained the external dependencies and was not able to explain the internal factors that affected innovation.

2.2.6 Game Theory

Game Theory (GT) is a variant of the IOT, whose argument is that competition among players in an imperfect market is considered as a game, the outcome of which is dependent on various assumptions (Brown & Shoham, 2008). GT is a formal study of strategic decision making in an environment of diverse interests that include conflict and cooperation. The inherent assumption is that the rational individuals who have perfect information about their situation, whose fortunes are interdependent but their choices are often independent and diametrically opposed (Brown & Shoham, 2008). GT affects this study in the sense that all factors affecting innovativeness are entirely independent and take independent actions. Some of these actions may be as a result of a reaction to a preceding action by another variable, whereas they could also be entirely independent, with no influence from any of the other variables.

Game Theorists have however, been criticised for assuming that every player is rational and also not taking into account the possible existence of dominant behaviour amongst the individuals. Contrary to this, it is argued that accounting for all exogenous and endogenous factors that affect decision-making may be viewed as unrealistic (Gintis, 2009).

2.2.7 Institutional Theory of Organisations

The Institutional Theory of Organisations (ITO) is a cross-functional theory that dates back to the nineteenth century before the neo-classical social scientists led by Philip Selznick in the last half of the twentieth century popularized it (Bruton, Ahlstrom, & Li, 2010). There was a distinct proliferation of the neo-classical research in the 1970s. In the neo-classical model, it was argued that there were three pillars, namely regulative (formal-documented rules), normative (shared sense of appropriateness) and cultural-cognitive (taken-for-granted behaviour) that affected the institutional order (Scott, 2008; Berthod, 2017).

Research in ITO in entrepreneurship has extensively focused on three fields. The first is on the institutional setting, which requires an understanding of the context within which entrepreneurs operate, and includes factors such as entrepreneurial opportunity, access to markets, capital legitimacy and government regulation on venture creation. The second field is on cognitive and moral legitimacy of the venture activity in view of the social context in which firms operate. Legitimacy opens up opportunities for new ventures. The last field is on the creation of new institutions that support new ideas ventures. This may include lobbyists for setting new standards and procedures in novel industries, introduction of new standards and benchmarks on historical organisations, governments and other civic bodies (Bruton et al., 2010).

Although much empirical research has been carried out in this field, ITO has been criticised as being overly simplified and the perceived reduction of organisations to “local instantiations of institutions”. The decoupling of the behaviour of the institution from the institution itself, while conceptualising, remains a matter of discourse. This has necessitated the impetus to further empirical and context-based research in the phenomena of institutionalisation of structures (Bruton et al., 2010; Berthod, 2017).

2.3 Empirical Foundation of the Study

The next section outlines the empirical foundation of the study. It details previous empirical research that has been carried out on the study variables. The section is arranged on the basis of an integrated review of the relationships across the study variables. It completes by summarising the shortfalls of previous studies and opportunities for further research. The focus of the analysis of the relationships is the dependent variable.

2.3.1 Entrepreneurial Orientation and Firm Innovativeness

Empirical studies, albeit with limited consensus, have shown EO to be a requirement for innovativeness (Hult, Hurley, & Knight, 2004; Renko et al., 2009; Perez-Luno, et al., 2010; Laforet, 2011; George & Marino, 2011; Ruiz-Ortega et al., 2013; Andersen et al., 2015; Wales, 2016; Ejdys, 2016). There have been multiple approaches in studies to establish the relationships between the two variables across different contexts (George & Marino, 2011; Wales, 2016). Some of the approaches consider entrepreneurial orientation as a second order construct and studies its relationships to different constructs of innovation (Andersen et al., 2015).

A study on 149 manufacturing SMEs in Greece showed that organisations displayed varied EO and as a result of which, differences in outcome of innovativeness (Avlonitis & Salavou, 2007). Avlonitis & Salavou’s study focused on proactiveness and risk taking as dimensions of EO and product uniqueness and product newness as dependent variables. According to Avlonitis and Salavou, this pointed to a moderating impact on the relationship between EO and product innovativeness. Much earlier, Khan and Manopichetwattana (1989) had found that centralisation of decision-making in small firms varied inversely with innovation. Avlonitis and Salavou also established that proactiveness rather than risk taking was found to have a significant relationship with innovativeness. Avlonitis & Salavou further suggested a distinction in innovativeness between active entrepreneurs unlike passive entrepreneurs who adopted a more aggressive orientation in product innovativeness. Finally, the study established a need for similar studies in other countries and industries so as to validate the empirical data with theory.

On the basis of a sample of 400 Spanish firms, Perez-Luno et al., (2010) studied the relationship between EO and innovativeness having separated them into innovation explorers and exploiters. The study established that proactiveness and risk taking as dimension of EO affected innovativeness and that these relationships were moderated by ED. The effect of risk taking on innovativeness was however found to be inconclusive in other studies such as Rigtering (2013). Perez-Luno et al., further observed that innovation is a combination of exploration and exploitation depending on the firm's unique circumstances. This study had limitations in the several ways. In the first instance, universal validity may not apply as the study was on specific industries in a specific country. Secondly, due to being a cross sectional study, causalities were not inferred and there was a need for a longitudinal study. Thirdly, the study was not controlled for some additional variables and these could have influenced the relationships in the model.

In a study on 164 Iranian SMEs, Madhoushi, Sadati, Delavari, Mehdivand, & Mihandost, (2011) established that EO through knowledge management as a mediating variable, affected the innovation performance of firms. The study highlighted the need to understand integrated influence of the internal factors like organizational knowledge, knowledge management process, entrepreneurship process. The scope of the study did not consider technological capability and effect of environment dynamism. With a response rate of 48%, there was also a likelihood of nonresponse bias.

Joshi, Das, & Mouri (2015) investigating the role of proactiveness and risk taking in technology-based industries in the US concluded that both have a significant relationship with innovativeness. Further to this, they established that whereas proactiveness has an inverted U-shaped curvilinear relationship, risk taking had a positive linear relationship with innovativeness. In both instances, these relationships were moderated by the organizational structures. Although this study had a sampling frame of over 900 samples, only 139 responses were collected leading to a response rate of 15% and thus risk of non-response bias was deemed high.

Ejdys (2016) in a Polish study affecting 137 SMEs also studied the two constructs of proactiveness and risk taking and their effect on innovativeness. The study confirmed that pro-activeness affected innovativeness. It also confirmed that risk taking affected pro-activeness. Ejdys' study was however, unable to confirm that risk-taking as a dimension had an effect on firm innovativeness. The study confirmed the earlier positions by scholars on the conversations around the conceptualization of entrepreneurial orientation (George & Marino, 2011; Andersen et al., 2015). The study further confirmed the findings of Perez-Luno et al, 2010 that established that innovation as a combination of exploration and exploitation.

In a cross-sectional purposeful survey on 196 manufacturing SMEs in Kenya, Gudda (2017) established that proactiveness and risk-taking dimensions affected SME product innovativeness, confirming the results of previous studies. The study proposed a need for further firm-level research of this nature so as to conceptualise this relationship further. Having applied a purposeful sampling method, a likelihood of common response biases was evident. The study only focussed on two sub dimensions of EO and did not study the influence of autonomy and competitor aggression.

Pustovrh et al., (2017) opined that even though EO affects innovativeness and thereafter facilitates innovativeness, subsequent commercialisation was not certain without the commercialisation enablers being in place. Pustovrh et al further identified intellectual property, spatial and network aspects of organisation of R&D teams, and management analysis on the operational and implementation aspects of open innovation in firms as important areas that required additional analysis.

In a study that focussed on the effect of entrepreneurial orientation on growth of manufacturing SMEs in Nairobi Kenya, Katialem, Muhanji, & Otuya, (2018) found that risk taking and proactiveness as dimensions of entrepreneurial orientation did not explain the growth of manufacturing SMEs. Even though the area of focus was similar to this study, Katialem et al., 2018 did not focus on the antecedents of innovativeness an area that has continuing discourse.

In spite of these developments, there are still divergent opinions on the causal relationship within the key dimensions of EO (Wiklund & Shepherd, 2005; George & Marino, 2011; Andersen et al., 2015; Wales, 2016). The relationship of EO and the dependent variables requires additional conceptionalisation (Perez-Luno et al., 2010; Joshi et al., 2015, Ejdys, 2016). This notwithstanding, there is a need for further studies to validate these conceptual arguments across various geographies and industries and indeed Bor, (2018) observed that most of the studies that were done in Kenya had a specific focus on areas other than SMEs.

2.3.2 Entrepreneurial Orientation, Technological Capability and Firm Innovativeness

It has been established that technological capability has a positive relationship with entrepreneurial orientation (Renko et al., 2009; Ruiz-Ortega et al. 2013). In a study on Scottish firms, Miller and Toulouse (1986) established that technological capabilities in SMEs were affected by the level of support or proactivity from the entrepreneur. This position was further confirmed by Yi-Ying (2011) who further posited that the entrepreneur also drove connectedness within the firm that allowed transparent decision-making and information availability within the firm.

Acosta et al. (2012) studied 59 micro enterprises, 20 small enterprises and one medium-sized enterprise in Colombia which were technology intensive in their operations and were suppliers to the large firms in different industries. Acosta et al., sampled firms that contributed to expanding the backward linkage bases of different industries in different parts of the world. The study sought to understand how EO and other additional factors influenced the improvement of TC. The study found that EO played a mediating role and positively influenced TC. The universal validity of these findings was however, not certain in several ways. For instance, the choice of samples indicated a high concentration of microenterprises and a prior rejection of over 60% of MSMEs on the initial population list thereby creating a potential bias. The study also focused on a specific geography and industry and there is need for a broader context.

There is a broad consensus that the growth of innovativeness has been due to the influence of technological capability (Suarez-Villa, 1990; Kortum & Lerner, 1999; Khayyat & Lee, 2015). Although Zhou & Wu (2010) found that the association between technological capability and exploitative and explorative innovation remained indistinct, Perez-Luno et al. (2010) established that firms with strong technological capabilities increasingly undertook exploitative innovation projects for product development. Perez-Luno et al. opined that they would then venture back into explorative innovation when low on funds. This is because the firms maximise on their resources, learn from their experience and on the basis of feedback are able to integrate these insights into the design process (Neely & Hii, 2012).

Conversely, Zhou and Wu (2010) found that in explorative innovation, technological capability had an inverted U-shaped relationship with innovativeness. This relationship implied that innovativeness increased in the same manner as technological capability but at a certain stage, it started declining as more technological capability was made available. Zhou and Wu argued that this was because exploratory innovation required a substantial investment of resources and additionally, absorbing new ideas and products into a prevailing system confronted firms with challenges of execution. According to Arnold and Thuriaux (1997), SMEs had limited technological capability due to their limited resources and opted to pursue exploitation instead of explorative innovation.

In a study on the characteristics that affect a firms' technological innovation capability, Yam, Lo, Tang, and Lau (2010) considered them as those that facilitate and support technological innovation strategies. Yam et al., (2010) identified the characteristics as learning, R&D, resources allocation, manufacturing, marketing, organisation and strategic planning capabilities. Yam et al., studied 200 manufacturing SMEs in the Hong Kong/Pearl River Delta Region and concluded that different characteristics behaved differently against different performance measures that included innovation performance. In this specific study, it was noted that amongst the seven characteristics, organisation capability was found to be associated with innovation performance. On a consolidated basis, Yam et al. found that there were direct and indirect relationships amongst these characteristics that ultimately led to an overall improvement in technological innovation performance. The study concluded that the technological innovation performance of a firm is greatly affected by the commitment of the top management or the owner.

Whilst some studies suggest that SMEs are agile and rapidly adapt to technology for higher growth (Storey, 1994), O'Regan and Ghobadian (2005) submitted that they did not always transform research and development into successful innovation, instead preferring to focus on time-tested products effectively being exploitative innovators. It was also confirmed that TC, combined with a high level of centralised decision making and networking, positively affected innovation in SMEs (Chang, Hughes, & Hotho, 2011). Besides, it was also proven that public research expenditure had a positive relationship with innovativeness (Heimonen, 2012). Much later, in a study to establish an index for the measurement of TC, Khayyat and Lee (2015) established that national policy considerations were an important factor for innovativeness and as such significant budgetary provisions had to be provided for both research and incentive schemes for creativity and innovativeness.

Salisu and Baker (2018) opined that innovativeness was caused by the firm’s resources that included technological capabilities. The study posited that firms generally engaged in the development of technological capabilities, leading to improved product, and enhanced productivity whilst creating the firm’s competitiveness. Effectively, Salisu & Baker concluded that the locus of a firm’s competitive advantage was determined by its audaciousness towards technological capability. On the basis of their literature review, Salisu and Baker suggested that technological capabilities and product innovation performance were significantly and positively affected by linkages with other partners as a result of effective technological collaboration. The study however, stopped short of empirically validating the proposed model.

Numerous studies allude to an influence of technological capability on innovativeness (Suarez-Villa, 1990; Arnold & Thuriaux, 1997; Kortum & Lerner, 1999; Khayyat & Lee, 2015). Similarly, other studies have also demonstrated a relationship between entrepreneurial orientation and technological capability (Renko et al., 2009; Yi-Ying et al., 2011; Chang et al., 2011; Ruiz-Ortega et al. 2013). The exact role of technological capability on innovativeness is however not fully conceptualized (Perez-Luno et al., 2010; Zhou & Wu, 2010; Khayyat & Lee, 2015). Moreover, a study on the two variables and their relationship to firm innovativeness is similarly not exhausted (Khayyat & Lee, 2015; Salisu & Baker, 2018). Much of the research on technological capability has been in either developed countries or newly industrialised countries with research in the developing countries still in the nascent stages (Acosta, Nabi, & Dornberger, 2012; Mkalama et al., 2018).

2.3.3 Entrepreneurial Orientation, Environmental Dynamism, and Firm Innovativeness

In 1989, Khan & Manopichetwattana sought to establish whether the characteristics of innovative and non-innovative small manufacturing firms in Texas, United States were different. The study found that innovation was affected by environmental dynamism and that a firm needed to be innovative so as to survive. Khan and Manopichetwattana also found that the age of the firm was found to be negatively correlated with product differentiation, suggesting that differentiation lessens as industry and markets mature. The study definition of SMEs, as firms that had up to 500 employees, differed with many countries and as such the results may not be universally valid.

In a study on family owned SMEs in United Kingdom, (Laforet, 2016) established that outwardly focussed culture had a positive effect on family firm innovation performance whereas on the other hand inwardly focus did not have an effect. On the basis of a Kenyan case study, Bwisa & Ndolo (2011) posited that Hofstede's classical dimensions of culture affected entrepreneurship and innovation in differing ways. Most of the extant research reviewed focussed on the impact of static culture on innovation. Narrowly related to culture, are ongoing and varying discourses on how different regions and locations affect innovativeness in SMEs (Heimonen, 2012).

Chang et al., (2011) in a study on 1,000 Scottish SMEs, sought to determine internal and external antecedents of SME innovation outcomes. The study showed that internal organisational structures in a highly dynamic environment motivated choices of additional innovation. Chang et al., further showed that the relationship between organisational and environmental forces and firm performance was partially mediated by innovativeness. The study was deemed to have some methodological weaknesses. These ranged from response validity to reliability of measurement instruments.

On the basis of a study on 164 SMEs in the Netherlands, Kraus, Coen Rigtering, Hughes, & Hosman (2012), sought to establish the impact of entrepreneurship on SMEs under environmental turbulence. Kraus et al., (2012) opined that different external circumstances affected firms' performances. In the study, it was also showed that whereas proactiveness and innovativeness firm behaviour positively affected SME performance during the dynamic times, innovative SMEs performed better in turbulent environments. Krause et al., posited that during dynamic time, the innovative firms however took measured risk. Kraus et al., also showed that there was a negative influence of firm's age on the EO. Kraus et al., established that the moderating effect of environmental turbulence on innovativeness was significant. Some of the weaknesses identified with the study included response biases due to low response rates. In addition to this, the findings lacked a universal validity as they were limited in their context. Finally, the entrepreneurial orientation and environmental measurement scales utilised required further empirical testing and development.

Ruiz-Ortega, et al., (2013) studied how external and internal factors independently and jointly influenced EO on the basis of a study on 253 Spanish SMEs in information technology. The study demonstrated that ED and TC significantly affected EO. Furthermore, the study indicated that access to and control of superior technological capabilities drove firms to be more proactive and innovative thereby accepting the risk involved. The study had several limitations, which included the fact that being cross-sectional, causal relationships were not explored. Finally, the study focused only on the ICT sector and may thus not be universally applicable.

A study by Okeyo (2014) sampled 150 lower-tiered SMEs in Kenya and sought to establish the relationship between environmental turbulence and the firms' performance. The study confirmed that environmental dynamism has an effect on the performance of SMEs. It further established that environmental dynamism, complexity and munificence had a moderating influence on entrepreneurial orientation in Kenyan SMEs. The limitations are derived from operational definition of the sample SMEs, thereby affecting the universal validity of the results. Finally, the study also did not focus on the antecedents of innovativeness as a dimension of EO.

Omri (2015) in a study of 283 Tunisian SMEs, sought to explore the relationship between innovative behaviour and firm performance. The study confirmed that environmental dynamism differentially moderates the efficiency of managerial behaviour and innovation strategy in SMEs. The study did not establish any causal relationships and was limited contextually. Furthermore, the study did not review the antecedents of innovativeness as a dimension of EO.

Staniewski, Nowacki, and Awruk (2016) in a study on 608 Polish construction firms confirmed that there was a significant relationship between what happens in the external environment and the final outcome of its innovativeness. This study was carried across all the regions of Poland, but with a specific focus on the construction industry and this was deemed as not representative of the entire SME segment. The study however did not focus on entrepreneurial orientation as a specific study variable.

Musawa and Ahmad (2018) studied the influence of EO and ED on market innovation performance on SMEs and argued that there was a moderating influence of ED on the five dimensions of EO. Being a literature review, the paper robustly provided a conceptual framework on the role of EO on innovation performance of SMEs, but stopped short of empirically validating the hypotheses offered by the authors.

Zhai, Sun, Tsai, Wang, Zhao, and Chen (2018) using a survey of over 300 manufacturing SMEs in China, examined the effects of entrepreneurial orientation, absorptive capacity, and environmental dynamism on technological innovation performance in SMEs. The study found that ED moderated the relationship between absorptive capacity and entrepreneurial orientation and innovation performance. Universal validity of the survey results may not apply as the study was carried out in a specific area in China. Secondly, being a cross-sectional study, the scope for causal events was not considered.

Vonortas and Safioles (1997) in a longitudinal study demonstrated that within the information technology industries, developing country SMEs sought out foreign collaborators in their efforts to become world players in their respective fields. Conversely, SMEs have also been known to resort to co-opetition as a coping measure with a resultant impact on innovation (Gnyawali & Park, 2009). Co-opetition manifested itself in a local study on manufacturing SMEs in the western region of Kenya and showed that it affected innovativeness in the firms studied (Gudda, Bwisa, & Kihoro, 2013).

Other adaptive measures include strategic alliances, networking and an enabling national level innovative system, which have similarly and separately been shown to have an effect on innovativeness of SMEs (Vonortas & Safioles, 1997; Szeto, 2000; Mothe & Link, 2002; Ndemo, 2015; Cornel University, INSEAD and WIPO, 2016). Scholars have reasoned that there was a need for consolidation of innovation ideas and have an effective national innovation system as well as effective innovation promotion policies in the developing economies so as to support entrepreneurship at the MSMEs level (Acosta et al., 2012; Ndemo, 2015; Cornel University, INSEAD & WIPO, 2016).

Kiveu (2017) sought information on the nature and type of innovation cooperation partners that manufacturing SMEs in Nairobi had. Kiveu's study established that knowledge partners like consultants, public and private research bodies or institutions of higher education, formed only 24% of the total number of innovation cooperation partners. The same study established that suppliers and other peers formed 46% and 16% respectively of the knowledge sources and this information was mostly done either informally or through recruitment of staff from those firms.

The construct of environmental dynamism and conditions necessary for extreme environmental and market turbulence is still under conceptualised (Chang et al., 2011; Kraus et al., 2012; Zhai et al., 2018). Extensive studies on environmental dynamism have been focused on its relationship and firm performance. Even though numerous studies demonstrated a moderating relationship, the relationship between entrepreneurial orientation and environmental dynamism and its influence on firm innovativeness requires additional conceptualization (Chang et al.,2011; Kraus et al., 2012; Heimonen, 2012; Musawa & Ahmed, 2018). These studies are handicapped by measurement instruments that are not fully tested (Kraus et al., 2012). This forms a potential additional research area.

2.3.4 Entrepreneurial Orientation, Technological Capability, Environmental Dynamism and Firm Innovativeness

Martins and Terblanche (2003) further isolated strategy, structure, support systems, innovation encouraging-behaviour and open communication as factors that affected creativity and innovation within an organisation. Innovation was also found to occur in harsh operating environments which were characterised by dynamic technological shifts, severe competition and short product life cycles (O'Regan & Ghobadian, 2005; Yi-Ying, 2011). This created an underlying reason to determine the composite relationship between the internal and external circumstances affecting innovativeness.

In an exploratory study affecting 151 mechanical and electrical engineering SMEs in the Netherlands, Keizer, Dijkstra, & Halman (2002), established that innovation amongst SMEs is affected by both internal variables, which include characteristics and internal workings of an SME, and the available opportunities in the external environment. The study may not have suitably addressed the common method biases associated with telephonic interviews. The operationalisation of the variable innovation also came out as a concern. Being an exploratory study in a specific industry and in a particular geographical area, it lacked the geographical validity of the study across other parts of the world.

Renko et al. (2009) carried out a cross-country empirical survey in the United States, Finland and Sweden on the basis of qualitative and quantitative data to study the relationship between market orientation, entrepreneurial orientation and technological capability on innovativeness in biotechnological start-up firms. Renko et al. established that there was a relationship between technological capability and innovativeness. Curiously, the same study was not able to confirm a relationship between EO and innovativeness. A *post hoc* analysis of these findings attributed this to the operational definition of the dependent variable. The study may also have been affected by common method and non-response biases. Renko et al. did not also consider any causal relationships, bearing in mind that this being a biotechnology firm, any possible innovation developments that took time to manifest themselves. In addition to this, the study was limited to only three countries and within specific industries thus limiting the generalisation.

Technological capability and environmental dynamism were found to be antecedents for successful innovation (Subrahmanya, 2007; Khayyat & Lee, 2015). Subrahmanya (2007) further opined that environmental dynamism generated an appropriate market demand that subsequently spurred an increased demand of the invented products or services. In addition to this, technological capability was found to positively affect the relationship of environmental dynamism on entrepreneurial orientation (Subrahmanya, 2007; Ruiz-Ortega et al., 2013).

Bouncken, Pluschke, Pesch, & Kraus (2014) in their cross-sectional survey involving 171 German firms studied the relationship between entrepreneurial orientation, technological uncertainty, in-learning and joint product innovation in those firms that were in a vertical alliance. The study found that a firm's entrepreneurial orientation (EO) affected joint product innovation within a vertical alliance and that this was influenced by increasing technological uncertainty and the absorption of skills and expertise from the alliance partners. Bouncken et al., (2014) further established that that EO interacts negatively with technological uncertainty, effectively implying that environmental dynamism had an effect on the relationship between EO and innovativeness. The study did not consider causal relationships and had a limited geographical and industrial context. Finally, the study was also limited to only one side of the alliance and therefore there could be specific biases in this respect.

SMEs that have inadequate capital applied supplementary strategies that allowed them to either form strategic alliances, benchmark or network thus leveraging on the distinctive skills that each small firm brought to the table (Suarez-Villa, 1998). This was also found to be the case in Malaysia and Australia (Yahya, Othman, Rahman, & Moen, 2011). Eggers, Kraus, & Covin (2014) on the basis of a sample of 283 SMEs studied the effect of networking on radical innovativeness on manufacturing SMEs. The study concluded that networking had a positive effect on radical innovativeness, in addition to customer responsiveness and technological turbulence.

Martinez-Roman & Romero (2017) postulated that SME innovativeness was affected by the owner's disposition, which in turn affected by their organisational internal circumstances as well as external effects. In a Spanish study affecting 1,500 SMEs, it identified two separate dimensions in the innovativeness of the firms namely capabilities for internal innovation and the capabilities for the adoption of technology as a result of external influence. Whereas the postulation on the owners' impact on innovativeness was confirmed, the effect of both the internal and external influence was inconclusive. The study being limited to Spanish manufacturers may not universally apply.

Bodlaj & Cater (2018) studied how turbulence in the market and technological as well as competitive intensity affected the perceived importance of innovation and innovativeness and business performance in SMEs. The import of the study was to empirically examine the direct effects of environmental turbulence on innovativeness. This was on the basis of a sample of 373 Slovenian SMEs. They concluded that both market and technological turbulence affect innovation, but only market turbulence directly impacted upon SMEs' innovativeness. Innovation was found to mediate the environmental turbulence's influence on a firm's innovativeness. This was an internet survey and the main limitation faced was the narrow operationalisation of innovativeness, thereby only having a small number of drivers within the variable.

Although there have been numerous studies on the research variables, there are still ongoing conversations on the four constructs (Miller, 2011; Khayyat & Lee, 2015; Wales, 2016; Martinez-Roman & Romero, 2017). In addition to this, the impact and intensity of the relationships of the study variables suggest that there are areas that require further scrutiny (Renko et al., 2009; Rigtering, 2013; Joshi et al., 2015; Bodlaj & Carter, 2018). The implication is that the dependent variable has not been exhaustively understood and conceptualized (Perez-Luno et al., 2010; Perez-Luno & Blasco, 2015; Ejdys, 2016; Martinez-Roman & Romero, 2017).

2.4 Summary of Knowledge Gaps

A review of literature, indicates that there is a lack of coherence in the conceptualisation of innovativeness and its antecedents (Martinez-Roman & Romero, 2017). Most of the studies have tended to focus on performance as the dependent variable, whereas there are emerging studies that suggest that there are other areas that may not have been exhaustively evaluated (Wales, 2016). Innovativeness remains under-conceptualised (Perez-Luno et al., 2010). The interaction between environmental dynamism and the inherent technological capabilities, has been such that there have been new demands on innovativeness (Bodlaj & Cater, 2018). It should be noted that innovativeness is incremental and accumulated over a period of time (Suarez-Villa, 1990). As a result, there is a need of further investigations to evaluate the impact of all the afore-mentioned factors on innovativeness.

The discourse also revolves around the conceptualisation of entrepreneurial orientation (Miller, 2011). There is no common position on whether the dimensions should be treated as uni- or multi-dimensional. On the other hand, there are still conversations on whether other dimensions beyond the initial three Miller dimensions should be considered (Miller, 1983; Covin & Slevin, 1989; Lumpkin & Dess, 1996; Miller, 2011; George & Marino, 2011; Wales, 2016). There is a need to understand the influence of other moderating and mediating interations.

Contextually, most of the research on the antecedents of innovativeness has been carried out in the developed world and on specific industries and thus might not universally apply. There is thus an established need for future research in the conceptualisation of the dimensions of EO across various contexts (George & Marino, 2011; Rigtering, 2013; Wales, 2016). Due to the complexity of information requirements around SMEs, it has not been possible to exhaustively study this area and thus achieve consensus and more so in developing countries (Khayyat & Lee, 2015). In terms of methodology, the studies reviewed had methodologies that were mostly designed to suit their environment and as a result, weaknesses were observed that ranged from sample designs, measurement scales, treatment of various biases to validity and reliability tools.

A summary of significant knowledge gaps has been identified and captured in Table 2.1. They have been categorised as either conceptual, contextual or methodological gaps.

Table 2.1: Summary of Key Findings and Knowledge Gaps

Researchers and Year of Study	Name of Study	Independent Variables	Dependent Variables	Sample Size	Finding	Gaps
Martinez-Roman & Romero, 2017	Determinants of Innovativeness in SMEs	Decomposition into sub- variables identified seven (7) business and four (4) personal characteristics that are deemed to affect innovativeness.	Innovativeness	312	This was a study in Manufacturing SMEs in Spain. The principal component analysis carried out in the study identified the core dimension of a firm's innovativeness and its technology adoption activities as affecting a firm's innovativeness.	There was a contextual gap in the sense that universal validity of the results needed to be established in other territories. Secondly, conceptually, there were inconclusive findings on the effect of internal and external influence. In addition to this, the dimensions of entrepreneurial orientation were not studied.
Pustovrh et al., 2017	Antecedents and Determinants of High-Tech SMEs Commercialisation Enablers	External Factors, Open Innovation Collaboration, and Innovation Facilitating Activities	Innovativeness which in turn affects commercialisation enablers	105	This was a Slovenian study on Manufacturing and Service SMEs. Whereas it was established that innovativeness, affected commercialization enablers, it was further confirmed that there was strong and statistically significant relationship between open innovation collaboration and innovativeness. Similarly, external factors and innovativeness had a strong link.	There was a contextual gap in the sense that universal validity of the results needs to be established in other territories. Secondly, conceptually, the operationalisation of open innovation was inadequate and did not include common open innovation activities. The study also did not explore the relationship of entrepreneurial orientation. In terms of methodological gaps, respondent biases were not addressed.
Gudda, 2017	Effect of Entrepreneurial Orientation on SME Product Innovativeness	Entrepreneurial Orientation (Proactivity, Risk Taking)	Product Innovativeness	196	This was a study on Manufacturing SMEs in Kenya. The study established that proactiveness and risk-taking dimensions affected SMEs product innovativeness.	The study was a purposeful survey that could lead to response bias. Secondly, conceptual gaps in that two dimensions of entrepreneurial orientation have not been addressed.
Ejdys, 2016	Entrepreneurial Orientation and Innovativeness of Small and Medium Enterprises	Entrepreneurial Orientation (Proactiveness & Risk Taking)	Innovativeness	137	The study focused on Production (15%) and Service SMEs (85%) in Poland. The cross-sectional study confirmed that proactiveness as a dimension of EO affected innovativeness. It also confirmed that risk taking affected pro-activeness It was however unable to confirm that	The study had contextual limitations as the study studies a specific sector and is within a specific geographical region. Conceptually, the study only addresses the effect of two dimensions of entrepreneurial orientation on innovativeness.

Researchers and Year of Study	Name of Study	Independent Variables	Dependent Variables	Sample Size	Finding	Gaps
					risk taking affected innovativeness.	
Joshi, Das & Mouri, 2015	Antecedents of Innovativeness in Technology-based services: Peering into the Blackbox of Entrepreneurial Orientation	Entrepreneurial Orientation (Proactiveness & Risk Taking); Organisational Structures	Innovativeness	139	The study was on technology-based SMEs in United States. Proactiveness and Risk Taking were found to have a significant relationship with innovativeness. Organisational structures had moderating effect on these relationships.	There was a contextual gap in that the study was limited geographically and industry-wise. Conceptually, multiproduct firms may exhibit different levels of innovativeness and this was not measured. Further, two dimensions of entrepreneurial orientation were not studied.
Ruiz-Ortega et. al., 2013	Environmental Dynamism and Entrepreneurial Orientation: The Moderating role of firms' capabilities	Technological Capability, Environmental Dynamism	Entrepreneurial Orientation	253	This cross-sectional study established that there was significant relationship between the environmental dynamism and technological capability on Entrepreneurial Orientation. It also showed that the existence of TC, greatly strengthened the ED-EO relationship.	Contextually, the study is limited to one industry and specific regions in the world and, therefore, universal validity may not apply. Information technology SMEs Study in Spain. Methodologically, there was a possible respondent bias.
Rigtering, 2013	Entrepreneurial Orientation: Multilevel Analysis and Consequences	Entrepreneurial Orientation; Market Turbulence; Positive Organisational Behaviour	Business Performance	164	The study was on service and manufacturing SMEs in Netherlands. Innovativeness is related to firm performance; Risk taking does not positively affect firm performance under highly turbulent conditions; Positive Organisational Behaviour affects Firm Performance	Conceptually, the study focused on only two dimensions of entrepreneurial orientation. Methodically, the study relied on self-reported data, hence the risk of common method bias.
Prihadyanti, 2013	Process and Source of Innovation in SME: Case of Indonesia' Food and Beverage	Qualitative Research/ Knowledge building	Qualitative Research/ Knowledge building	2	The study was on manufacturing SMEs in Indonesia. Process of innovation involves, internal parties, external parties as well as owner engagement	There were contextual gaps as the study lacked universal validity; limited to one geography as well as one segment and being case study thereby requiring further validation. Conceptually, the study did not delve into the concept of entrepreneurial orientation. Methodologically, the findings could not be generalised.

Researchers and Year of Study	Name of Study	Independent Variables	Dependent Variables	Sample Size	Finding	Gaps
Neely and Hii, 2012	The Innovative Capacity of Firms	Qualitative Study/Knowledge Building	Qualitative Study/ Knowledge Building	75	The study was on manufacturing SMEs in England. This was a cross-sectional study with no hypothesis to test but rather on the basis of knowledge building. Established that innovativeness is affected by culture, resources, skills and networking.	Contextually, the study lacks universal validity as it is restricted to east of England, thereby creating some contextual gaps. Methodologically, the sampling procedure may be vulnerable to biases. Conceptually, the study was not focussed on entrepreneurial orientation as a variable.
Chang et al, 2011	Internal and External Antecedents of SMEs Innovation Ambidexterity Outcomes	Internal Organisational Structure (Centralisation & Connectedness); External Environmental Changes.	Innovation Ambidexterity; Business Performance	265	The study was on manufacturing and Service SMEs in Scotland. TCs with a high level of centralised decision making and networking allowed innovation to thrive	There were contextual gaps as the study lacked universal validity because it was limited to one. Conceptually, the study did not focus on entrepreneurial orientation as a variable.
Perez-Luno, et al., 2010	The Dual Nature of Innovative Activity: How Entrepreneurial Orientation influences innovation generation and adoption.	Entrepreneurial Orientation	Innovativeness	400	This was a cross- sectional survey on general SMEs in Spain. that showed that entrepreneurial orientation predicted innovativeness.	There are contextual gaps in the study, as it lacks universal validity due to geographical and sectoral limitations. There are also methodological gaps, as there is a risk of validity threat on measurement scale for proactivity dimension of entrepreneurial orientation. Conceptually, the study also did not focus on two dimensions of entrepreneurial orientation.
Renko et al., 2009	The Effect of a Market Orientation, Entrepreneurial Orientation, and Technological Capability on Innovativeness	Market Orientation, Entrepreneurial Orientation, Technological Capability	Innovativeness	85	The study focussed on biotechnology SMEs in United States, Finland and Sweden. This was a cross- sectional survey to establish the effect of the independent variables on innovativeness. The study showed that both technological capability and entrepreneurial orientation were positively related to innovativeness.	Contextually, the study lacks universal validity as it is limited to three countries in the Developed World. There are methodological concerns and limitations, including small sample sizes that could have also affected statistical validity.

Researchers and Year of Study	Name of Study	Independent Variables	Dependent Variables	Sample Size	Finding	Gaps
Radas & Bozic, 2007	The antecedents of SME innovativeness in an emerging transition economy	Identified factors that affect innovation as well as challenge innovation and thereafter sought a correlation.	Knowledge Building on the basis of identified factors	448	This was a study of manufacturing and service SMEs Study in Croatia Innovativeness is affected by both internal and external factors. Challenges do not necessarily affect innovation, but only spur firms to be innovative.	Contextually, the study lacks universal validity as it was limited to Croatia. Conceptually, the study did not focus on entrepreneurial orientation as a variable in the study.
Gilbert, 2007	Firm Innovativeness in SMEs: Lessons from Japan	Principle Component Analysis yielded three factors namely work place related; environmental related and strategic factors as affecting innovativeness.	Mixed Method/ Knowledge building	1852 samples and subsequently 10 case studies	This was a multi-industry study in Japan. Innovativeness is affected on the basis of the identified three factors of internal, external and strategic disposition of the firm.	Contextually, the study lacks universal validity as it is limited to geography. Conceptually, the study did not specifically focus on entrepreneurial orientation.

2.5 Conceptual Framework

Whereas it is acknowledged that there is no common agreement on how to treat EO, this study viewed it as a second order construct. This is on the basis that previous studies have tended to show a high correlation within these dimensions (Rauch et al., 2009). This study proceeded on the basis that EO significantly affects innovativeness (Hult, et al., 2004; Avlonitis & Salavou, 2007; Renko et al., 2009; Ejdys, 2016).

TC has also been shown to have a relationship with EO (Arnold & Thuriaux, 1997) and also directly related to innovativeness (Zhou & Wu, 2010). Inasmuch as Ruiz-Ortega et al., (2013) established that TC has a moderating effect on ED, the study did not explore that relationship in this instance, but rather study a mediating relationship. Therefore, in the study conceptual model, TC was considered as the intervening variable.

The third variable, ED was found to affect TC and EO of SME firms (O'Regan & Ghobadian, 2005; Miller, 2011). Ultimately, the interplay between these two variables affected innovativeness of the SME firm (Perez-Luno et al., 2010; Ruiz-Ortega et al., 2013). ED was considered as the moderating variable as it affected the behaviour of EO, which in turn influenced the dependent variable of firm innovativeness. The study progressed on the basis that there was a relationship between the study variables, giving rise to the conceptual model in Figure 2.1 that was proposed for investigation.

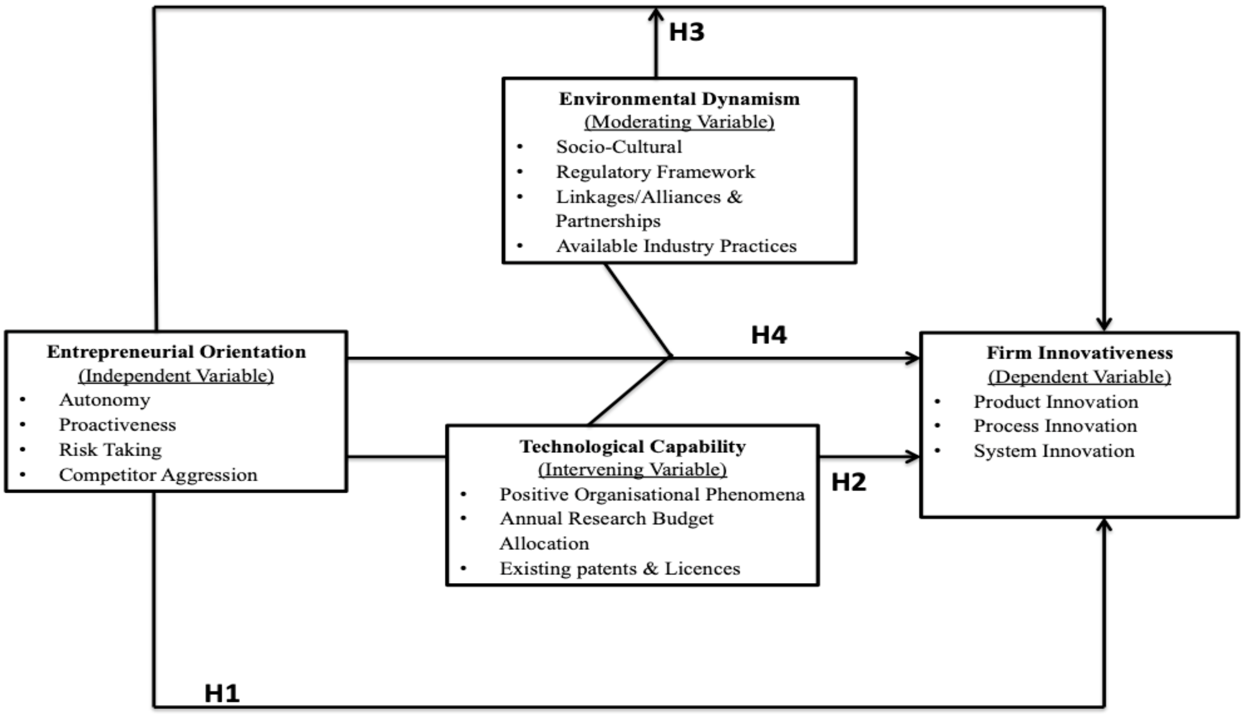

Figure 2.1: The Conceptual Model

2.6 Conceptual Hypothesis

A synthesis of the literature review indicated that there was a need to study further the relationship of four variables, namely the entrepreneurial orientation, technological capability, environmental dynamism and innovativeness of firms. On the basis of the study objectives and the conceptual model, hypotheses were formulated and tested in the study.

The first objective of the study was to establish the relationship between entrepreneurial orientation and innovativeness of manufacturing SMEs in Nairobi. This generated the following alternate hypothesis for empirical validation and testing: -.

H1: *Entrepreneurial Orientation significantly affects Firm Innovativeness in Manufacturing SMEs*

The second objective was to determine whether there was a mediating effect on the relationship between entrepreneurial orientation and innovativeness in manufacturing firms in Nairobi. This generated the second alternate hypothesis as; -

H2: *Technological Capability mediates the relationship between Entrepreneurial Orientation and Firm Innovativeness in Manufacturing SMEs.*

The third objective was to determine the moderating effect of environmental dynamism on the relationship between entrepreneurial orientation and innovativeness of manufacturing SMEs in Nairobi. This subsequently led to the formulation of the third alternate hypothesis as follows; -

H3: *Environmental Dynamism moderates the relationship between Entrepreneurial Orientation and Firm Innovativeness in Manufacturing SMEs.*

The fourth objective was to establish the joint effects of entrepreneurial orientation, technological capability, environmental dynamism on firm innovativeness in manufacturing SMEs in Nairobi. This led to the formulation of the fourth alternate hypothesis as follows; -

H4: *Entrepreneurial Orientation, Technological Capability, Environmental Dynamism have a significant joint effect on Firm Innovativeness in Manufacturing SMEs.*

On the basis of the data results, the hypotheses were tested and presented in Chapter 5 of this thesis.

2.7 Chapter Summary

Chapter Two provided a detailed literature review for an appreciation of the previous research and published studies on the identified study variables. It started by providing the theoretical foundation, and giving details of the anchoring theories and models that support the study. These theories are summarised as General Systems Theory and, more specifically, the Open Innovation Model, the Diffusion of Innovation Theory, the Resource-Based View, the Industrial Organisation Theory, specifically the Game Theory and the Institutional Theory of Organisations.

The chapter then provided a review of conceptual and empirical research that has been carried out on all the variables in a hierarchical progression. This review finally synthesised the gaps in the literature that needed to be addressed. A conceptual model demonstrating these variables and relationships was subsequently developed leading to formulation of the hypotheses of the study that was to be tested. The next chapter provides the Research Methodology used in the study.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter discusses the research methodology adopted during the study. The study sought to establish and asses the factors that affect innovativeness in manufacturing SMEs. In this respect, the research philosophy is firstly articulated, leading to a justification of the research design adopted. In this chapter, the research population, sampling design and control variables are described. The operationalisation of all the research variables is then discussed and presented in the chapter.

The chapter then proceeds to identify the data collection tools. A pre-analysis description of the data obtained is presented. This includes the sample response rates as well as the confirmatory tests on the results obtained. These tests include checks on validity, reliability, normality, and multicollinearity. A brief discussion on the confirmatory tests is presented. The chapter concludes with a discussion on how analysis of the collected data was done.

3.2 Research Philosophy

There are two main schools of research philosophy, namely the positivist and the constructionist schools (Sekaran & Bougie, 2013; Blumberg, Cooper, & Schindler, 2014). The positivists' view of the research world is that all phenomena can be observed, described from an objective standpoint and that the observers need not interfere with phenomena being observed (Saunders, Lewis, & Thornhill, 2009; Blumberg, et al. 2014).

This view is more popular with the physical scientists. Positivists are also concerned with developing knowledge over the existing theory and therefore hypothesis testing. For its part, the constructionist school argues that there is an element of subjectivity required in the interpretation of phenomena (Saunders et al., 2009; Sekaran & Bougie, 2013; Blumberg, Cooper, & Schindler, 2014). As a result of this subjective interpretation, there are many variations in interpretation and therefore outcomes of seemingly same stimuli may be a function of an individual's perception of these trigger stimuli (Saunders et al., 2009). Constructionists also develop knowledge and do not need to test any hypothesis.

This study adopted the realism philosophy which is between the two extreme philosophical thoughts (Saunders, et al.,2009; Sekaran & Bougie, 2013). The ontology of realism is that the existence of a "real world" is such that it is not perfectly in tandem with the theoretical constructs and as such triangulation from additional sources is required to validate it (Sobh & Perry, 2006; Maxwell & Mittapali, 2010). Indeed, Harrison Birks, Franklin, and Mills (2017) argued that the realism philosophical inclination was to use science to understand the nature of reality, whereas appreciating that all dimensions are imperfect, a position that this study concurred with. The realism approach adopted some of the principles of either of the two extreme positions (Sekaran & Bougie, 2013; Blumberg et. al, 2014). These principles included the use of surveys and hypothesis testing from the positivists' school, whereas case study and qualitative analysis was adopted from the constructionist school (Harrison et al., 2017).

This fledgling philosophical approach is relevant as innovativeness has been theorised as being affected by external factors as well as those that are individual and subjective in nature (Cornel University, INSEAD and WIPO, 2016). It has further been argued that due to the complexity of information requirements on SME Innovation, such information cannot be reduced to basic indicators (Martinez-Roman & Romero, 2017). On this basis, there was a need for a deep interpretation of some of the observed variables and thus required a research design that went beyond the objective description of phenomena (Saunders et. al, 2009; Sekaran & Bougie, 2013). Realism has increasingly been found useful by social scientists despite the possibility of having contradictory findings (Sobh & Perry, 2006).

The study adopted the realism approach and started off with theory testing, further refinements of the findings and then a confirmation of the phenomena (Marchal, Belle, Olmen, Hoeree, & Kegels, 2012; Manzano, 2016). In all instances, every effort was made to obtain facts objectively and neither were the researcher nor the enumerators part of the firm's processes (Blumberg et al., 2014). Researcher interference was limited to the extent of the research strategy. A deductive approach allowed the study to obtain quantitative data, build and test hypothesis as per the objectives of the study and thereafter a refinement and further testing of the phenomena was used by the study to confirm and develop the theory (Manzano, 2016; Harrison et al., 2017).

3.3 Research Design

A research design indicates the manner in which data will be collected and analysed so as to cost-effectively attain the research objectives. A multi-method cross-sectional survey that observed the variables in an *ex-post facto* design (Blumberg et al., 2014) was used.

Multi-method research designs are recommended in social sciences because they have the potential to enrich our understanding of the various phenomena (Molina-Azorin, 2010, 2016; Mckim, 2017). Indeed, McKim (2017) posited that in as much as mixed research required additional resources, time and expertise there was a complimentary benefit of rigorous methods, different persepectives and provision of a deeper meaning to the phenomenon under study.

Consequently, for a better understanding of the variables, a multi-method data collection approach was used to obtain both qualitative and quantitative data (Saunders, et al., 2009). This approach was found to be particularly useful in similar previous studies (Gilbert, 2007; Kimeme & Mbwambo, 2009; Neely & Hii, 2012; Doroodian, Ab Rahman, Kamarulzaman, & Muhamad, 2014). Mixed methods approach gave scholars a chance to integrate findings and interpretations from different approaches thereby providing an avenue to address the critiques on limations of studies that rely either solely on quantitative or qualitative methods (McKim, 2017).

Qualitative data obtained through the case studies enabled the iterative testing of the study variables theorised and tested during the quantitative stage (Sekaran & Bougie, 2013; Blumberg et al., 2014; Manzoni, 2016). The qualitative approach helped in explaining in deeper details, the ultimate outcomes due to the fact that the analysis technique consisted of matching empirically observed events to theoretically predicted outcomes (Yin, 2009; Manznoni, 2016).

A cross-sectional field survey and multiple case design was used in the study to obtain information across multiple samples and cases at a specific point in time and in a real-world environment (Sekaran & Bougie, 2013; Blumberg et al., 2014). Some of the advantages of using a field survey, include cost effectiveness, capability for rapid and extensive data collection as well as having an inherent ability to postulate on a population on the basis of a smaller part of it (Saunders et al., 2009; Sekaran & Bougie, 2013; Blumberg et al., 2013). Cases studies allow an intense investigation of phenomena over a specific number of cases (Yin, 2009; Blumberg et al., 2014). The final survey data collection was carried out over a period of six months, from November 2018 to April 2019.

3.4 Population of the Study

The study focused on formally licensed manufacturing SMEs in Nairobi as the research population. A research population is the total number of similar subjects that a researcher would like to obtain inferences about (Blumberg et al., 2014). The population of the study was based on data from Nairobi County Government Registry as at 31st December 2017, which indicated that the total number of licensed firms was 7,396. The list was further culled to exclude firms that were out of the scope of the study.

Bearing in mind that it is estimated that 46% of the SMEs in Kenya do not survive beyond the first year, the scope of the study was limited to firstly, firms that were above one year in operation as the time of survey (KNBS, 2016; Ndemo & Mkalama, 2018). This was to mitigate against the survivor bias. Secondly, the firms had to be within the small and medium manufacturing category of activities as per the earlier definition in Section 1.1.5. The limitation of the scope of the firms served as an additional way of reducing sampling error. The final list of 3,962 firms was then considered as the research population.

3.5 Sampling Design

Sampling is the process by which a researcher obtains a small available part of the entire population to be studied to save on time, resources and yet retain the practicability and representativeness of the entire population (Saunders et al, 2009; Blumberg et al., 2014). The unit of analysis was the specific SME firm studied.

The estimated total sample size was arrived at using Yamane's Formulae, which was previously successfully used for stratified samples (Israel, 1992; Singh & Masuku, 2014). It was derived as follows;

$$n = \frac{N}{1+Ne^2}$$

where:

n= Sample size; N = Target Population; e = Margin of error at 5% (95% Confidence level)

On the basis of the above formula the study sample size was calculated as 363, which was 9.16% of the research population.

The study adopted a multi-stage sampling process involving probability techniques. To allow increased statistical efficiency (Migiro, 2005), a stratified random sampling method was used. This has been used in similar previous studies by Migiro (2005) and Kithusi (2015). Stage one involved classifying the target population into five strata on the basis of the nature of industrial activity carried out by the firm. Each of these strata was adapted from the KNBS 2016 Survey, and had some underlying circumstances that made them behave in a homogeneous way within the strata as compared to external patterns (Blumberg et al., 2014). These strata classifications included manufacturers in textiles and apparel; fabricated metal products; food products; furniture, wood and products of wood and cork; chemicals, chemical products and plastics; and other manufacturers.

During stage two sampling and subject to their availability, probability techniques were used to randomly obtain samples for each of the five strata for the study. This was previously found to be very effective (Szeto, 2000; Migiro, 2005). The total number of samples picked in each stratum was consistent with the proportion of the sample to research population and equal to 9.16%. The distribution is shown in Table 3.1.

Table 3.1: Distribution of Sample Sizes Across Sectors

Segment of Manufacturing	Estimated Population Size	Total Questionnaires Distributed	Returned Questionnaire	Response Rate (%)	Proportion of Sampled Surveys in Strata (%)
Textile and Apparel	951	87	32	36.8	13.5
Fabricated Metal Products	674	63	47	74.6	19.8
Food Products	594	54	51	94.4	21.5
Furniture, Wood and Products of Wood and Cork	594	54	49	90.7	20.7
Chemicals and their Products, and Plastics	1,148	105	53	52.4	22.4
Other			5		2.1
Total Valid Surveys	NA	363	237	65.3	100%
Eliminated Surveys	NA	0	8	NA	NA
Grand Total	3,962	363	245	67.5	NA

Source: Field Data, 2019

According to Table 3.1, during the full-scale questionnaire survey, a total of 363 questionnaires were distributed, out of which a total of 245 were completed and returned. Of the returned questionnaires, one firm whose age was less than one year as at the time of the survey, was eliminated. Seven firms fell outside the defined scope of the industrial sector and were also eliminated from the samples analysed. The spread of the samples across the various segments was considered adequate. Of the responses received, none of the strata exceeded 25% of the entire sample population. Eight questionnaires were eliminated, leaving a total of 237 completed survey responses that were considered as good for further analysis.

3.6 Data Collection and Instrumentation

Two data collection methods were applied. In the first method, a self-administered drop-and-pick questionnaire, to which an appropriate introduction letter from the University of Nairobi and a research authorisation from the National Council of Science and Technology (NACOSTI) were attached and issued to the identified respondent firms. In the second stage, the researcher carried out the case interviews. The methodology for the case studies is explained in detail in Chapter 5.

To pre-test the data collection instrument, a pilot study data collection was done between January and April 2018. The main purpose was to address the content validity of the survey instrument so as to identify and overcome any potential challenges to administering the instrument. Additional reasons for the pilot test were to estimate the length of the survey, gauge the experience of the respondents after having gone through the survey, evaluate whether the understanding of the questions was consistent with what the study sought to achieve whilst being conscious of any cultural sensitivities to the way the questions were framed.

Data collection for the main research survey was carried out between November 2018 and April 2019. Extensive use was made of research assistants as enumerators and these were identified for suitability and appropriately trained for consistency in the execution of the survey questionnaire. The number of questionnaires issued out to respondents was recorded. As a proactive measure, the enumerators were encouraged to explain to the respondents the procedure around the survey. The enumerators also carried out a pre-administration assessment to firstly, determine whether the firms fell within the desired scope and secondly, to gauge the initial level of enthusiasm of the potential respondent firms. Where the potential respondents were unenthusiastic or did not fall in the defined scope of firms, the enumerator did not issue the questionnaire and instead proceeded to the next target respondent who was randomly selected. No incentives were provided to the respondents, but the enumerators were remunerated on a piece-meal basis, against completed surveys, making it important for them to spend time in building consensus and enthusiasm from the target respondents. This assessment aided in reducing the non-response rate of the sampled firms.

In all instances, efforts were made to issue the questionnaire to the entrepreneur as the key respondent. Where this was not possible, and prior to the issuance, the enumerator explained to the owner manager on the need to assign the exercise to someone who was sufficiently competent to discuss the marketing and operations of the firm. In addition, some sections of the questionnaire had semi-structured open-ended questions to be used for consistency and obtaining additional information. So as to complement this additional data, it was triangulated across the various other sources so as to corroborate the findings.

3.7 Operationalisation of the Research Variables

As earlier indicated in Figure 2.1, the study considered the relationships between four variables, namely entrepreneurial orientation, technological capability, environmental dynamism and innovativeness. Operationalisation of variables has been described as reducing abstract constructs into a measurable and observable set of characteristics (Sekaran & Bougie, 2013). In the study, the information was obtained by having specific open and closed questions that were used to obtain both qualitative and quantitative data (Sekaran & Bougie, 2013).

Entrepreneurial orientation was considered as a second order construct and considered configuratively as having five dimensions, namely autonomy, proactiveness, risk taking, innovativeness and competitor aggression (Lumpkin & Dess, 1996; Lumpkin, 2009; Ruiz-Ortega et al., 2013; Wach, 2015). Autonomy described the level of independence of the individual. Proactiveness described the ability of the individual to determine the future changes and suitably position oneself to capitalise on this opportunity. Risk taking was considered as the propensity to make decisions in uncertain circumstances, thereby deriving uncertain outcomes. Competitor aggressiveness referred to the assumption of a posture that was aggressive when compared to other competitors. Innovativeness was considered as the level of openness and pursuit of new ideas.

These constructs involve elements of subjectivity and relativity and therefore, a multi-item five-point likert scale was used to obtain the data. This was consistent with measurement scales used in previous studies (Covin & Slewin, 1991; Lumpkin & Dess, 1996, 2001; Lumpkin et al., 2009). In the operationalisation of EO, innovativeness was dropped as a dimension on the independent variables in this study, but retained as a dependent variable. This was also consistent with previous research (Sekaran& Bougie, 2013; Joshi et al., 2015; Ejdys, 2016; Gudda, 2017). The operationalisation of EO appeared in Section B of the questionnaire (Appendix I).

Technological capability was measured as a composite score made up of qualitative statements that evaluated organisational phenomena that allowed change and nurture innovation. As discussed in Section 1.1.2, a good measurement scale of technological capability has to include items of available patent and licences to the firms, access to published knowledge and information and its subsequent diffusion, funds dedicated to innovation, skills availability for innovation and level of utilisation of information technology. Some of these variables could be obtained objectively by use of ratio scale. However, the measurement of some of the variables was deemed to be vulnerable to common variance validity issues that included subjectivity. As a result of this, a multi item five-point likert scale was used to obtain data on this indicator (Renko et al., 2009; Zhou & Wu, 2010; Maria Alejandro & Pietrobelli, 2012; Khayyat & Lee, 2015). This was covered under Section A and C of the Questionnaire (Appendix I).

Environmental dynamism was operationalised as a uni-dimensional construct that was made of composite measure of four indicators, namely socio-cultural dimensions; regulatory framework; linkages, alliances and partnerships and available industry practices. Socio-cultural dimensions measured elements of diversity and tastes of the consumers within their setting. The dimension on regulators assessed the interactions with industry regulators. The dimension on linkages, alliances and partnerships measured the interactions with other players in the same industry or with common goals. The final dimension on available industry practices assessed the level of interactions and familiarity of the firm with the contemporary industry practice. Due to the subjectivity of the information sought, a multi-item 5-point likert scale was used to evaluate the measures. This was consistent with previous studies that measured environmental dynamism (Miller, 1987; Garg et al., 2003; Wiklund & Shepherd, 2005 and was covered under Section D of the Questionnaire (Appendix I).

Innovativeness was operationalised in both qualitative and quantitative ways. Derived from the recommended measurements in the Oslo Manual, a measurement was made on the number of products, processes, and changes adopted in the respondent firm (OECD, 2005). However, after the pilot survey and in an effort to have more clarity, the measurement was modified to include a three-item five-point likert scale that was deemed to be more effective and reliable in measuring the indicators. These items were a set of bipolar statements that focused on new products, risk taking and proactiveness. These were adapted from the previous measurement scales (Miller & Friesian, 1983; Massa & Testa, 2008; Perez-Luno & Blasco, 2015) and were covered as Section E in the Questionnaire (Appendix I).

In addition, there were additional measures that included the amount of investment dedicated to research and innovation. This was a ratio scale and showed the amount estimated to have been spent in the previous year on innovation. This was consistent with OECD (2005). The second measure, included the number of patents or special licences that were uniquely available to the firms for their use and was also consistent with OECD, 2005. These two measures were covered under Sections A: 11-13 and Section A: 14-18 of the Questionnaire (Appendix I).

The questionnaire was divided into five sections. Section A focused on data on basic information of the firm. This included information on the demographic and organisational profile of the firm. The next four sections focused on each of the study variables. A summary of the operationalisation of the indicators is shown in Table 3.2.

Table 3.2: Operational Indicators Summary

Variable	Operational Indicators	Measurement	Supporting Literature	Questionnaire Item
SME Organisational Data and General Information	This was mixed data that included • Open ended information • Annualised budgetary allocation (Value) • Existing patents & licenses (Number)	Mixed		Section A
Entrepreneurial Orientation (Independent Variable)	This was a composite score made up of the following indicators assessed by qualitative statements; - • Autonomy • Proactiveness • Risk Taking • Competitor Aggression	5 –point Likert Scale	• Lumpkin & Dess, (1996) • Lumpkin & Dess, (2001) • Covin & Slewin, (1991) • Lumpkin et al., (2009)	Section B Sub-section 1-4
Technological Capability (Intervening Variable)	This was a composite score made up of the following indicator that was assessed by qualitative statements: • Positive Organisational Phenomena (Qualitative Statements)	5-point Likert Scale	• Renko et al. (2009) • Zhou & Wu (2010) • Maria Alejandro & Pietrobelli (2012) • Khayyat & Lee (2015)	Section A: 8-13 Section C Sub-section 3
Environmental Dynamism (Moderating Variable)	This was a composite score made up of the following indicators assessed by qualitative Statements; - • Socio-Cultural • Regulatory Framework • Linkage/ Alliances & Partnerships • Available Industry Practices	5-point Likert Scale	• Miller (1987) • Garg et al., (2003) • Wiklund and Shepherd (2005)	Section D
Innovativeness (Dependent Variable)	This was a composite score made up of the following indicators; - • Qualitative Statements • Number of New Product Innovations • Number of New Process Innovation • Number of System Innovations • Annualised Budgetary Allocation • Existing Patents and Licenses	5-point Likert Scale Ratio Scale	• OECD (2005) • Miller &Friesian (1983) • Massa & Testa (2008) • Perez-Luno & Blasco (2015)	Section E

3.8 Survey Confirmatory Tests

3.8.1 Tests on Validity

Tests on validity are necessary to confirm whether or not the technique as designed, measures the desired outcome (Blumberg, et al., 2014). Threats to validity may be either internal or external. Internal validity applies to whether the tests carried out are able to demonstrate the cause and effect of the relationship. In this study, one concern was whether the technique was able to identify if any of the independent variables affected the dependent variable. External validity sought to explain whether the results of the outcome of the tests could be used to generalise over a bigger sample or population. Similarly, in the study, the concern was whether it could be generalised that the independent variables affected the dependent variables.

In addition, validity may be either construct or content related (Sekaran & Bougie, 2013). Construct Validity related to how the instrument was designed and included the type of questions that were adopted. To address the construct validity, a review of previous literature assisted in constructing the questionnaires and the areas to be tested. Feedback from doctoral supervisors, peers and colleagues from the University of Nairobi's School of Business further strengthened the instrument. In addition to this, convergent and discriminant validity tests were also carried out as applicable.

Content validity relates to how the questions were organised within the instrument. To address the content validity, the survey questionnaire was also pilot-tested so as to identify and overcome any potential challenges to administering the instrument. The pilot study involved 40 manufacturing SME firms, which were randomly selected but were well-distributed across the strata. The selected entrepreneurs were asked to complete the questionnaire as well as facilitate the completion by two other senior members of staff responsible for operations and the sales/marketing function. Of the firms selected, 25 responded and returned the questionnaires, which were then assessed for completeness.

It was observed that the respondents were reluctant to complete more than one questionnaire per firm. It was further observed that respondents were reluctant to complete specific parts in the questionnaire that required information over a period of three years. It was also observed that many firms were hesitant to offer responses with detailed financial information with some avoiding the questions altogether, or providing information that appeared unrealistic.

The pre-test data was then analysed using the SPSS Software. Descriptive statistics were used in an analysis of Sections C, D and E. In terms of the completeness of the questionnaires, it was observed that only 8% of the pilot sample had up to three questions that were not completed, indicating a general level of discomfort with the designed questions. It was further observed that the mean values of the responses to the items, which had been measured with the five-point Likert Scale, ranged from 3.0 to 3.5. This was considered adequate.

It was further observed that responses to the quantitative measures under the dependent variable in the pilot questionnaire was spurious. Apart from no-responses to this last section, those that had been completed had a wide variability. This suggested that the set of questions used was unreliable. As a result, the measurement scale on the dependent variable was extensively modified, ultimately making use of the Miller & Friesen Scale rather than exclusively relying on the OECD definitions. After the pilot study, ambiguous, unclear and irrelevant questions in the questionnaire were also clarified and/or expunged altogether.

The questionnaires were subsequently modified and the main survey undertaken. None of the firms in the pilot survey were used in the main survey. In addition, there was a series of post- administration evaluation checks to confirm the completeness of the questionnaires. The enumerators' supervisors randomly telephoned one out of every five respondent-samples to verify the source of the information. In addition, the researcher randomly called by telephone, one out of every 20 questionnaires for post-administration verification.

3.8.2 Tests of Reliability

Tests of reliability were carried out to confirm the extent of measurement errors by the technique that was applied. On this basis, the study was able to determine the precision, consistency and accuracy of the results (Saunders, et al, 2009; Drost, 2011; Sekaran & Bougie, 2013). For this reason, the Cronbach's Alpha coefficients were determined and are shown in Table 3.3.

Table 3.3: Tests of Reliability

Variable	No. of Items	Cronbach's Alpha coefficient	Decision
Entrepreneurial Orientation	24	0.805	Very Reliable
Technological Capability	10	0.553	Reliable
Environmental Dynamism	18	0.606	Reliable
Firm Innovativeness	3	0.724	Very Reliable

Source: Field Data, 2019

As presented in Table 3.3, the entrepreneurship orientation subscale consisted of 24 items ($\alpha = 0.805$). The technological capability subscales had 10 items ($\alpha = 0.553$). The items for environmental dynamism were 18 ($\alpha = 0.606$) whilst the items for firm innovativeness were 3 ($\alpha = 0.724$).

The most commonly used measure has been the recommended cut off by Nunnally (1978) of 0.7, however, recent research recommended that a coefficient higher than 0.5 should be considered as acceptable, with a score that is greater than 0.7 being strongly reliable (Pallant, 2005; Sekaran & Bougie, 2013; Kithusi, 2015). The tests for entrepreneurial orientation and firm innovativeness were considered as very reliable. On the basis of the scores, the results for technological capability and environmental dynamism were also accepted as reliable.

3.8.3 Tests of Normality

An assumption of statistics is that populations are normally distributed (Saunders, et al., 2009; Sekaran & Bougie, 2013; Blumberg, et al., 2014). A distribution is said to be normal when the biggest proportion of occurrences happen around the mean. Scholars have argued that if this assumption is not withheld, then the conclusions about the estimates may not be reliable and accurate (Saunders, et al., 2009; Sekaran & Bougie, 2013; Blumberg, et al., 2014). The study sought to investigate whether the responses from the samples tested had a normal distribution. Although either the Shapiro-Wilk or Kolmogorov-Smirnov (K-S) Tests can be used to test for normality, the Kolmogorov-Smirnov Test is generally preferred for samples greater than 50 (Blumberg, et al., 2014) and was used. According to the test statistics, if the cut-off value is less than 0.05 on the basis of 95% confidence interval level, then the null hypothesis of normal distribution was rejected. If on the other hand, the value is greater than 0.05, the null hypothesis of normal distribution is not rejected. The results for the Kolmogorov-Smirnov (K-S) tests are shown in Table 3.4.

Table 3.4: Kolmogorov-Smirnov Test Results

	N	Normal Parameters[a, b]		Most Extreme Differences			Test Statistic	Asymp. Sig. (2-tailed)
		Mean	Std. Deviation	Absolute	Positive	Negative		
Autonomy	237	3.3409	0.51733	0.088	0.088	-0.053	0.088	.000[c]
Proactiveness	237	3.1579	0.57023	0.089	0.089	-0.059	0.089	.000[c]
Risk Taking	237	3.1674	0.57825	0.146	0.146	-0.075	0.146	.000[c]
Competitor Aggression	236	3.5501	0.70607	0.142	0.142	-0.099	0.142	.000[c]
Technological Capability	237	3.1396	0.51178	0.115	0.115	-0.055	0.115	.000[c]
Environmental Dynamism	237	2.973	0.42558	0.105	0.105	-0.079	0.105	.000[c]
Firm Innovativeness	183	3.8798	0.6817	0.18	0.18	-0.141	0.18	.000[c]

Notes: a. Test distribution is Normal. b. Calculated from data. c. Lilliefors Significance Correction.

Source: Field Data, 2019

The findings in Table 3.4, are summarised as follows; - $D(237) = 0.088$, $p < 0.05$ for autonomy; $D(237) = 0.089$, $p < 0.05$ for proactiveness; $D(237) = 0.146$, $p < 0.05$ for risk taking; $D(236) = 0.142$, $p < 0.05$ for competitor aggression; $D(237) = 0.115$, $p < 0.05$ for technological capability; $D(237) = 0.105$, $p < 0.05$ for environmental dynamism; and $D(183) = 0.180$, $p < 0.05$ for firm innovativeness. The test statistics were in all instances less than 0.05 and were therefore found to be statistically significant. On this basis, the null hypothesis for normal distribution was rejected.

A review of previous literature showed that scholars such as Altman and Bland (1995) argued that normal distributions of observed data were rare and that the most critical requirement was for the sample values to be compatible with the population. Further, Ghasemi and Zahediasl (2012) posited that where the K-S test has rejected the null hypothesis and the samples size is greater than 30, the results can still be used. Furthermore, Ho and Yu (2015) argued that non-normality does not imply intrinsically defective data, but places a responsibility on the scholars to find a model that is applicable rather than attempting to obtain data that is fitted into a predetermined model.

The variables were then plotted as shown in Figure 3.1, as a box-plot. The box-plot distributions show normal distributions across the various variables. This graph indicates that Entrepreneurial Orientation was plotted into sub-variables and had scores that ranged as follows; -Autonomy ranged from 2.3 to 4.3; Proactivity from 2 to 4.4; Risk taking from 2.2 to 4; and Competitor Aggression from 2.3 to 4.7. Technological Capability scores ranged from 2.4 to 4. Environmental Dynamism ranged from 2.2 to 3.8. Firm Innovativeness ranged from a score of 3 to 5.

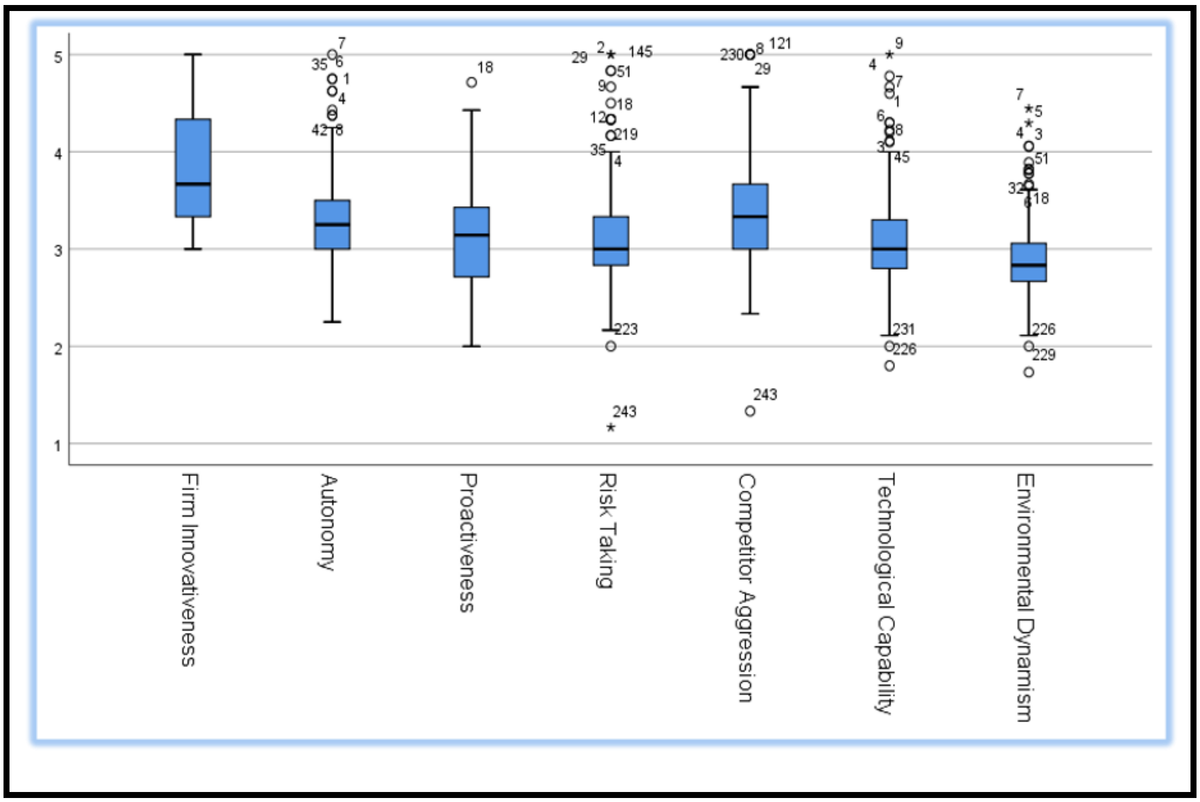

Figure 3.1: Box Plot Distribution of the Variables

The findings on the box-plot results in Figure 3.1, show that the scores on proactiveness as a dimension, were positively skewed. Skewness refers to the concentration of the frequency of the scores around the highest. A distribution is said to be positively skewed when the tail is to the right of the peak. In this case, the mean score was greater than the mode. Similarly, environmental dynamism and firm innovativeness, as composite scores were also positively skewed. Conversely, autonomy, risk taking and competitor aggression were negatively skewed. Technological capability as a composite variable was also negatively skewed.

3.8.4 Tests of Multicollinearity

Multicollinearity is when two or more independent variables demonstrate a high correlation as a result of which it becomes difficult to isolate the separate effects of the individual variables (Sekaran & Bougie, 2013). Tests on multicollinearity of the independent variables were similarly carried out to evaluate whether or not they are highly correlated. Tolerance Value and their inverse, the Variance Inflation Factor (VIF) across the independent variables were also calculated. The results of the tests are as shown in Table 3.5.

Table 3.5: Tests of Multicollinearity

Coefficients[a]			
Variable		Collinearity Statistics	
		Tolerance	VIF
1	Autonomy	.492	2.032
	Proactiveness	.529	1.891
	Risk Taking	.512	1.952
	Competitor Aggression	.846	1.183
	Technological Capability	.398	2.509
	Environmental Dynamism	.454	2.201

Notes: a. Dependent Variable: Firm Innovativeness
Source: Field Data, 2019

From the findings in Table 3.5, the VIF value was well below 5, whereas the tolerance value is greater than 0.2 against a cut-off value of 0.2 and therefore multicollinearity was not deemed to be present in all the tested variables (Pallant, 2005). As a result of this, there was no need to take steps to reduce multicollinearity. The implication of this confirmation was that the data collected could be used to model linear or generalised linear regression equations with a considerable degree of accuracy.

3.9 Data Analysis

As a preliminary step, upon receipt of the completed questionnaire, they were checked for consistency on the numbered serialisation and to isolate any obvious inconsistencies. Data coding and entry happened and was subsequently reviewed for any data entry errors or illogical gaps and responses. In a few cases, there was a further follow-up to obtain clarity on the illogical gaps or responses. The calculated sample size was 363, out of which a total of 245 questionnaires were returned.

A first-level analysis of the returned questionnaires showed that 237 questionnaires were considered adequate for further analysis. This worked out to a response rate of 65.3%, which was considered acceptable on the basis of earlier comparable studies by Okeyo (2014) and Kithusi (2015). That still notwithstanding, there were a number of individual items that were not completed by the respondents. In such cases, each response that was not completed was considered as item non responses. Subsequently, the tabulated findings had an accompanying assessment of the item non responses and their subsequent treatments thereof (de Leeuw, Hox, & Huisman, 2003). These responses on the questionnaires were then coded and input into the analysis software.

3.9.1 Quantitative Survey Data Analysis

Analysis was carried out using Version 26 of the Statistical Package for the Social Sciences (SPSS) to search for trends and relationships in the data. Descriptive Analysis was used on all the responses to obtain measures of central tendency and dispersion. Specifically, it was used to ascertain the frequency distribution, mean, and the standard deviations of the various observed characteristics. Frequencies indicated the number of times the specific phenomenon occurred (Sekaran & Bougie, 2013). The mean as a measure of the central tendency (Sekaran & Bougie, 2013), indicates the generally accepted perception of the variables. Standard deviation, a measure of dispersion (Sekaran & Bougie, 2013), indicated that whether the level of consistency of the suggested perceptions was high. A high standard deviation meant that the level of inconsistency within the suggested phenomenon was high.

Inferential analysis was carried out on the coded data. Inferential statistics allowed the determination of relationships and drawing of conclusions on the basis of the sample (Sekaran & Bougie, 2013). On the basis of the conceptual model shown in Figure 2.1, various analytical models and tools were adopted. To test the hypothesis that EO significantly affects firm innovativeness, a Multiple Regression Model (MRM) was used. In addition to this, MRM was also used to test the sub hypothesis that there was a joint effect of the EO sub-variables on the dependent variable. MRM is used to test individual effects of a multivariate relationship on a dependent variable (Hair, Black, Babin, & Anderson, 2014).

The models applied were; -

$$Y_1 = \alpha_{10} + \beta_{10}X + \varepsilon_1$$

$$Y_1 = \alpha_{11} + \beta_{11}X_1 + \beta_{12}X_2 + \beta_{13}X_3 + \beta_{14}X_4 + \varepsilon_2$$

Where Y_1 = Firm innovativeness; X = Composite score for entrepreneurial orientation; X_1 = Autonomy; X_2 = Proactivity; X_3 = Risk taking; X_4 = Competitor aggression; $\varepsilon_{1,2} =$ Error

The first model represents the composite score for Entrepreneurial Orientation on the basis of aggregated effects of each of the sub-variables, whereas the second model is with the disaggregated scores. A positive coefficient (β) indicates a positive correlation between the predictor and the outcome variable.

Structural Equation Modelling (SEM) was used to test the hypotheses that TC had an intervening effect on the relationship between EO and Firm innovativeness. SEM has recently gained fame in its applications in social science research (McDonald & Ho, 2002; Babin & Svensson, 2012). Generally, SEM allows complex modelling between an independent and a dependent variable using covariance statistics (Babin & Svensson, 2012; Hair et al., 2014; Memon, Cheah, Ramayah, Ting, & Chuah, 2018).

An advantage of SEM was that it permitted the addition of latent variables into the analysis and was not restricted to the relationships amongst the observed variables and constructs (Carvalho & Chima, 2014). As a result of this addition, the variance explained in the dependent variable was larger because it reported both direct and indirect effects (Hair, Matthews, Mathews & Sarstedt, 2017).

Secondly, SEM allowed the measurement of error variances that could lead to an indication on the reliability of the measured constructs (Babin & Svensson, 2012; Hair et al., 2014). The use of latent variables has been argued to operationalise constructs and influence testing of theory and future replications (Babin & Svensson, 2012). A disadvantage of SEM however was that an inadequate measurement model would easily lead to an invalid and unreliable structural model (Grace & Bollen, 2015). SPSS AMOS 22 software module was used to analyse the data with respect to this hypothesis. To reduce the numbers of statements to be applied in the measurement model, a component analysis was also carried out, wherein principal components in each subsection were extracted.

A Principal Component Analysis (PCA) allowed the selection of a manageable subset of variables from a larger set (Kim, 2008). Subsequently two sets of equations were defined and modelled. These were the measurement set and the structural set of equations which allowed the creation of the both direct and indirect paths. In addition to this, correlation analysis was also conducted to confirm the relationship between EO and TC as well as the relationship between TC and Firm innovativeness. The pathways were represented by the following models; -

$$Y_2 = \alpha_{21} + \beta_{21}X + \varepsilon_3$$

$$Y_2 = \alpha_{21} + \beta_{22}X_6 + \varepsilon_4$$

$$X_6 = \alpha_{23} + \beta_{23}X + \varepsilon_5$$

Where Y_2 = Firm innovativeness; X= Composite score for Entrepreneurial Orientation;

X_6 = Composite score for Technological Capability; $\varepsilon_{3,}\ \varepsilon_{4,}\ \varepsilon_5$= Error

In the study, there were four variables and 237 samples and this was considered adequate for sample size.

To test the hypothesis that ED moderated the relationship between EO and Firm innovativeness, the Hierarchical Regression Modelling (HRM) was used. HRM involves the addition of independent variables into an equation until the addition no longer made a contribution to the variation *(R^2)* (Lewis, 2007). In the study, a non-linear model that is commonly applied (Pokhariyal, 2019) was used; -

$$Y_3 = \alpha_{30} + \beta_{31}X + \beta_{32}X_7 + \beta_{33}X.X_7 + \varepsilon_6$$

Where X= Composite score for Entrepreneurial Orientation; X_7 = Composite Score for Environmental Dynamism; ε_6 = Error.

There were 237 samples and two specified degrees of freedom. This was considered adequate.

To determine the joint effect of ED and TC on the relationship between EO and FI, a Multiple Regression Model was used to test individual effects of the multivariate relationship on a dependent variable (FI). The model applied was as follows; -

$$Y_4= \alpha_{40} + \beta_{41}X + \beta_{42}X_6 + \beta_{43}X_7 + \varepsilon_6$$

Where X= Composite score for Entrepreneurial Orientation; X_6 = Composite score for Technological Capability; X_7 = Composite Score for Environmental Dynamism; ε_7 = Error.

In addition to this, correlation analysis was also conducted to confirm the relationship between EO and TC as well as the relationship between TC and Firm Innovativeness.

The Analytical Models used are summarised in Table 3.6.

Table 3.6: Summary of Analytical Models and Test Statistics

Objective	Hypothesis	Analytical Model	Test Statistics	Interpretation
Establish the influence of EO on innovativeness	H1: Entrepreneurial Orientation significantly affects Firm Innovativeness in Manufacturing SMEs	Multiple Regression Equation $Y_1 = \alpha_{10} + \beta_{10}X + \varepsilon_1$ $Y_1 = \alpha_{10} + \beta_{11}X_1 + \beta_{12}X_2 + \beta_{13}X_3 + \beta_{14}X_4 + \varepsilon_2$ X_1 = Autonomy X_2 = Proactivity X_3 = Risk Taking X_4 = Competitor Aggression X= Composite score for Entrepreneurial Orientation	R R^2 *t*-test *F*-test	• R-value shows relationship between the independent and dependent variables • R^2 value shows variability of the variables around the regression line, • If *t*-value> critical value then variables are individually significant. • *F*-test determines overall significance of the model. If computed F is greater than F- critical at selected $\propto$ level, then overall model is significant
Establish whether there is an intervening influence on the relationship between EO and innovativeness	H2: Technological Capability intervenes the relationship between Entrepreneurial Orientation and Firm Innovativeness in Manufacturing SMEs	Structural Equation Modelling $Y_2 = \alpha_{21} + \beta_{21}X + \varepsilon_3$ $Y_2 = \alpha_{21} + \beta_{22}X_6 + \varepsilon_4$ $X_6 = \alpha_{23} + \beta_{23}X + \varepsilon_5$ X= Composite score for Entrepreneurial Orientation X_6 = Composite score for Technological Capability	χ^2 GFI R^2 *t*-test	• χ and GFI are acceptable then the measurement models are good for further analysis • R^2 value shows variability of the variables around the regression lines • *t*-test determines significance of the structural models.
Establish the moderating influence of ED on the relationship between EO and innovativeness	H3: Environmental Dynamism moderates the relationship between Entrepreneurial Orientation and Firm Innovativeness in Manufacturing SMEs	Hierarchical Regression Modelling $Y_3 = \alpha_{30} + \beta_{31}X + \beta_{32}X_7 + \beta_{33}X.X_7 + \varepsilon_6$ X= Composite score for Entrepreneurial Orientation X_7 = Composite Score for Environmental Dynamism	R R^2 *t*-test *F*-test	• R-value shows relationship between the independent and dependent variables • R^2 value shows variability of the variables around the regression line, • If *t*-value> critical value then variables are individually significant. • *F*-test determines overall significance of the model. If computed F is greater than F- critical at selected $\propto$ level, then overall model is significant
Establish the joint effect of EO, TC, and ED on innovativeness	H4: Entrepreneurial Orientation, Technological Capability, Environmental Dynamism have a joint significant effect on Firm Innovativeness in Manufacturing SMEs	Multiple Regression Equation $Y_4 = \alpha_{40} + \beta_{41}X + \beta_{42}X_6 + \beta_{43}X_7 + \varepsilon_7$ X= Composite score for Entrepreneurial Orientation X_6 = Composite score for Technological Capability X_7 = Composite Score for Environmental Dynamism	R R^2 *t*-test *F*-test	• R-value shows relationship between the independent and dependent variables • R^2 value shows variability of the variables around the regression line. • If *t*-value> critical value then variables are individually significant. • *F*-test determines overall significance of the model. If computed F is greater than F- critical at selected $\propto$ level, then overall model is significant

Where: $Y_{1\ldots4}$ = Firm Innovativeness; In addition to the above, α, β are coefficients and ε is error term.

3.9.2 Qualitative Case Study Analysis

In the case of qualitative data, purposively selected respondents were identified and interviewed. Categorisation of the information obtained was done and then a narrative analysis carried out. The information derived was then synthesised and consolidated with the earlier survey results into a cross firm analysis. Emerging issues from the cases reviewed were isolated, interpreted and themed on the basis of their narratives. This created a deeper understanding that allowed a consolidation of the indicators with the variables from the survey. The qualitative information obtained was triangulated against the quantitative information obtained so as to confirm its veracity or otherwise. These themes were further analysed and collapsed into *a priori* broad-based categories using logical similarities. This formed the basis for further discussions and interrogation against theory. A similar approach was used by Kimeme & Mbwambo, (2009). The approach is presented in more details in Chapter 5.

3.10 Chapter Summary

Chapter Three outlined the methodology used in carrying out the study. It articulated the research philosophy applied leading to the research design that was employed. It then outlined the sampling frame thereafter, providing details on the data collection method. The research data collected was both quantitative and qualitative. The chapter sketched how both types of data were collected. It also indicated how the variables were operationalised for the quantitative data collection, before providing a summary for the analytical models and the test statistics used. The next chapter presents the empirical findings of the quantitative questionnaire research.

CHAPTER FOUR

PRESENTATION OF FINDINGS FROM THE QUESTIONNAIRE SURVEY

4.1 Introduction

Chapter Four presents the quantitative findings of the field survey. In the first instance, a descriptive summary of the demographic and organisational profiles of the respondent firms is provided. Subsequently, a correlation analysis between these profiles and innovativeness was also carried out and presented. A brief preliminary discussion of these findings is also provided at this stage.

The chapter next provides a descriptive analysis on the responses provided across the various study variables that were studied. Consequently, an inferential analysis on the basis of the four hypotheses that were formulated was done. The findings from the analytical models that were constructed and tested for significance are finally presented and briefly discussed.

4.2 Descriptive Profile of the Respondent Firms

In line with the general objective of the study, information on various characteristics that so as to determine the profile of the respondent firms and their influence on innovativeness was sought. Some of the internal characteristics have been argued to influence entrepreneurial orientation of the firm owner and ultimately innovativeness of the firm. The internal characteristics that were sought included the age and gender of the entrepreneur.

The study also sought to determine the duration of operation of the respondent firms and the respondents were required to state the years of establishment of the firms. To establish the size of the firm, the respondents were asked to indicate the estimated sales turnover of the firm as well as an indication of the number of regularly employed staff.

The study also sought to understand whether other unique profiles of the firms affected innovation. This included an understanding of the initiator of the innovation in the firm. The respondents were asked to determine and state the initiator of the innovation process in the firm. The study also sought to establish how the financing of innovation was done. This included the sources as well as the type of finances available for innovation. To obtain this information, the respondents were required to respond to a series of open questions that required the respondent to state the sources and types of financing available to the firm for innovative activities. The research also examined challenges to innovation in the study firms and the respondents were asked to identify and state the biggest hurdles to their innovation process.

As part of commercialisation, the research also examined the intellectual property protection in the firm. The respondents were asked about their knowledge and practice of intellectual protection. For those who had not practised or were unaware of intellectual protection, the reasons thereof were obtained.

Descriptive analysis was subsequently carried out on the collected data. Mean scores (*M*) were obtained as a measure of the central tendency and referred to the average scored by each of the firms on the information sought. To obtain measures of dispersion, standard deviations (*SD*), variance (*VAR*) and coefficients of variation (*CV*) were obtained.

Standard deviation referred to the extent to which the score differed from the mean. A high standard deviation score implied the presence of distant outliers in the sample. Variance referred to the difference between the mean score and the individual score. A low variance score meant that the responses by the firms tended towards unanimity. A low *CV* implied a low diversity in the responses given by the firms and that the respondent opinion was unanimous. The descriptive findings are presented in the Sections 4.2.1 to Section 4.2.11.

4.2.1 Age Profile of Entrepreneur

The study sought to determine the age of the entrepreneur. Information on the age of firm entrepreneur was obtained by way of specific closed questions to the respondents. Due to the sensitivity around asking the respondents directly for the age of the respondents, and for the ease of analysis, the responses were banded into buckets. The lower limit was taken as 18 years, as this is the age at which an individual can get a business licence. The next age band was considered between 30 and 45. The lower age limit of the upper bracket was taken as 45, as this is the age commonly accepted as maturity. The age distribution was found to be as shown in the Table 4.1.

Table 4.1: Age Profile of Entrepreneur

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Between 18-30	7	3.0	3.0	3.0
	Between 30-45	84	35.4	35.7	38.7
	Above 45 years	144	60.8	61.3	100.0
	Total	235	99.2	100.0	
Missing	System	2	.8		
Total		237	100.0		

Source: Field data, 2019

The findings presented on Table 4.1, two respondents did not completely answer the items and this was categorised as Missing at Random (MAR) and being less than 1% of the completed responses, it was omitted from the analysis as recommended by de Leeuw et al., 2003. The findings show that 61.3% of the sample were above 45 years. Entrepreneurs who were thirty years and below formed three percent of the sample surveyed. Comparatively, Migiro (2005) found that 19.7% of his sample were below thirty years of age, whereas between thirty and fifty years formed the bulk at 66%. The study further opines that sample responses were well distributed across the demographic groups.

4.2.2 Gender of Entrepreneur

The study also sought to establish the gender of the principal owner of the firm. A closed question required the respondent to state the gender of the entrepreneur. The findings are presented in Table 4.2.

Table 4.2: Gender of Principal Owners

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	197	83.1	83.1	83.1
	Female	40	16.9	16.9	100.0
	Total	237	100.0	100.0	
Missing	System	0	0		
Total		237	100.0		

Source: Field Data, 2019

As presented in Table 4.2, even though the samples were randomly obtained, 83% of the firms surveyed were principally owned by men and 17% by women. Comparatively, Kithusi (2015) found that 13% of the respondents in his study were women. Wekesa (2015) also found that 36.5% of the respondents were women. Gachara and Munjure (2018) had 28% of their respondent firms owned by women. Moreover, a previous survey on formally licensed SMEs across all businesses (KNBS, 2016), showed that 47.9% were owned by men, 32% owned by women, and 16.5% being jointly owned suggesting that ownership was balanced and appeared higher than the reviewed studies.

4.2.3 Duration of Operation of Respondent Firms

The study also sought to establish the duration of operation. The purpose was two-fold, firstly to eliminate survivor bias, as any firm that was less than a year would automatically not be considered in the analysis and secondly, to consider whether the innovativeness is related to the number of years of operation. The number of years of operation was used as a proxy for the duration and therefore maturity of the firm. The distribution of the years of operation was fairly well spread-out as shown in Table 4.3.

Table 4.3: Duration of Operation of Respondent Firms

Band	Frequency	Percent	Valid Percent	Cumulative Percent
Less than 5 years	20	8.5	8.5	8.5
Above 5 years to 15 years	66	28.1	28.1	36.6
Above 15 Years to 30 Years	97	41.3	41.3	77.9
Greater than 30 years	52	22.1	22.1	100
Total	235	99.2	100.0	
Missing System	2	0.8		
Total	237	100.0		

Source: Field Data, 2019

The findings in Table 4.3 show that more than 63% of the respondent firms had over 15 years of operation in manufacturing. Conversely, 8.5% of the firms had less than five years of operations. Two respondents did not completely answer the items and these were categorised as MAR and being less than 1% of the completed responses, it was omitted from the analysis as recommended by de Leeuw et al., 2003. Comparatively, Kiveu (2017) had over 39.7% and Kithusi (2015) had over 5.4% of their respondent samples having over 15 years of experience in business.

4.2.4 Enterprise Characteristics of the Respondent Firms

The study also sought to establish other firm characteristics of the respondent firms. These characteristics included the size of the firm and innovation activity on the firm. Information on enterprise size was derived as a proxy of the number of staff in the firm, annualised sales turnover and the available budgetary resources for the firm. Information on innovation activity was also sought. The findings are presented in Table 4.4.

Table 4.4: Enterprise Characteristics of the Respondent Firms

Statistic	Years of Operation of Study Firm	Enterprise Size			Innovation Activity		
		Number of Staff	Annualised Sales Turnover (Kes)	Budget (%)	Product	Process	System
Mean	21.37	NA	52,540,978	7.2199	4	2	1.51
Minimum	2	1	500,000	0	0	0	0
Maximum	71	100	990,000,000	75	47	39	27
Std. Deviation	13.558	NA	150,016,209	12.72296	5.738	3.849	2.573
CV	63.4%	NA	285.5%	176.22%	143.45%	192.45%	170.4%

Source: Field Data, 2019

The findings on Table 4.4 show descriptive information on the characterisation of the firms on the basis of years of operation of study firm, enterprise size and innovative activity in the study firms. On the basis of the definition adopted in Section 1.15 of this study, the results indicated that 34.2% of the firms (81) surveyed were small enterprises, whilst 65.8% of the firms (156) surveyed were medium enterprises. The minimum number of staff regularly employed ranged from one to 100. This distribution varies when compared with KNBS 2016 Survey, which estimated that 91% of the firms when categorised according to number of employees are small enterprises as compared to 9% of the firms as medium enterprises. When categorised according to turnover, over 81% earn less than Kes.2.4 million, which is well within the small enterprises' category. A similar distribution was found in the study by Kiveu (2017), which had 65% as medium enterprises, while 35% were small enterprises.

The size of the firm was also determined by the sales turnover. During the survey, it was noted that information on sales turnover was not well recorded and archived in SME firms, and therefore, the responses received were varied. Moreover, the data collected was on the basis of 62.7% response rates for those surveys that were returned. Even though the sales turnover ranged from five hundred thousand Kenyan shillings to nine hundred and ninety million Kenyan shillings, the average sales turnover was on the lower end (M= Kes.52,540,978, SD = Kes.150,016,209, CV = 285.5%).

The average number of years of operation of the firms, which responded to this request for information raged from 2 years to 71 years (M= 21.37, SD=13.558, CV= 63.4%). The budgetary allocation on innovation ranged from 0 to 75% of the firm's overall expenditure (M= 7.2199, SD=12.722966, CV=176.22%). The number of innovation products in a firm ranged from 0 to 47 products in the previous year (M=4, SD=5.738, CV=143.45%). The number of process changes ranged from 0 to 39 process changes (M=2, SD=3.849, CV=192.45%) whereas the number of information technology-based system changes ranged from 0 to 27 (M=1.51, SD=2.573, CV=170.4%). Despite the wide variations, the findings indicated innovative activities within the firms.

4.2.5 The Innovation Process in the Firm

To appreciate the extent of possibility of change in the firm from inception, the study also sought information on whether or not there has been a change in the firm's operating model and procedures. This follows Schumpeterian's Theory on change being essential to firm's growth. To determine this, the respondents were required to provide closed responses on whether the firm's internal processes were the same as those that were in place at the inception of the business. The findings are presented in Table 4.5.

Table 4.5: Change of Innovation Processes in Firms

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	195	82.3	84.1	84.1
	Yes	37	15.6	15.9	100.0
	Total	232	97.9	100.0	
Missing	System	5	2.1		
Total		237	100.0		

Source: Field Data, 2019

The results in Table 4.5 showed that five respondents did not completely answer the items and these were categorised as MAR and being at 2% of the completed responses, it was omitted from the analysis as recommended by de Leeuw et al., 2003. Accordingly, the findings indicated that 84.1% of the firms had changed their operating models and they acknowledged that the model was not the same as at the time of establishment. These findings suggested that change was a common phenomenon within sampled firms.

4.2.6 Financial Resources for Creativity and Innovation

The study sought to measure the availability of financial resources for the purposes of creativity and innovation. This was determined by way of assessing the funds that are budgeted and set aside for innovation in the previous year. The allocation of financial resources would subsequently allow a firm to engage in various innovative activities. These range from as minor as market espionage to outright research and development expenditure. The findings are presented in Table 4.6.

Table 4.6: Financial Resources for Creativity and Innovation

Budget to Creativity and Innovation	Frequency	Percent	Valid Percent	Cumulative Percent
0%	9	3.8	4.2	4.2
Between 0- 5%	145	61.2	67.1	71.3
Between 5%-20%	47	19.8	21.8	93.1
Greater than 20%	15	6.3	6.9	100.0
Valid	216	91.1		
Missing	21	8.7		
Total	237	100.0		
Mean	7.2199			
Std. Deviation	12.7229			
CV	176.22%			
Minimum	0.00			
Maximum	75			

Source: Field Data, 2019

From the results in Table 4.6, it can be seen that 21 respondents who comprised of 8.7% were categorised as Not Missing at Random (NMAR) as the respondents were reluctant to disclose their responses (de Leeuw et al., 2003). Under these circumstances, it was omitted from this specific analysis. The findings therefore indicated that whereas less than 4.2% of the sampled firms did not invest whatsoever in creativity and innovativeness, more than 67% of the respondents spent up to 5% on innovation and creativity expenses. An additional 28.7% spent more than 5% of their annual budgets on innovativeness. This implied that there was an appreciation of the need to invest in innovative activities.

The level of investment varied with the individual circumstances of the respondent firms (*M*=7.2199, *SD*=12.72296, *CV*=176.22%). The findings from this study suggested that the allocation of the budget of financial resources that was subsequently spent for creativity and innovation was varied across the firms. Demirkan (2018) assessed the level of allocation of financial resources for innovation in biotechnology firms and concluded that the resources ranged from firm-level internal resources such as human assets to external network-based capital.

4.2.7 Initiation of the Innovation Process

Contextually, SME firms have different levels of decision-making. To understand this process with relation to innovativeness, the study also sought to identify who initiated changes to processes and products. The outcome of the responses is summarised in the Table 4.7.

Table 4.7: Initiation of the Innovation Process

Initiator	Frequency	Percent	Valid Percent	Cumulative Percent
Senior Management/Entrepreneurs	126	53.2	62.7	62.7
Customers	33	13.9	16.4	79.1
Staff	29	12.2	14.4	93.5
Senior Management/Staff Jointly	9	3.8	4.5	98.0
Regulators	3	1.3	1.5	99.5
Other External Factors	1	0.4	0.5	100.0
Missing	36	15.2		
Total	237	100.0		

Source: Field Data, 2019

From the findings shown in Table 4.7, it can be seen that 36 respondents were categorised as NMAR as the respondents were reluctant to disclose their responses (de Leeuw et al., 2003). These item non-responses were omitted from this specific analysis. The findings suggested that over 62% of the innovation was initiated by the management/entrepreneurs. Whereas this varied depending with the complexity of the firms, there is a large indication of centralised decision-making within SMEs. Customers initiated 16% of the new innovations in the sample. This was consistent with Voeten (2015), who argued that the source of innovativeness varied with the complexity of the firm. The results further suggested that the involvement of staff in the innovative process was in less than 20% of the firms. Changes that were initiated as a result of regulatory requirements occurred in less than 2% of the firms.

4.2.8 Source of Financing for Innovation

The study sought to understand the source of financing of the innovation for the sampled firms. Innovation requires investment in resources and it has been established that this is often expensive and traditional lenders are unenthusiastic to dabble in them (Spielkamp & Ramer, 2009; InfoDev, 2013). The findings on the source of financing are presented in Table 4.8.

Table 4.8: Source of Financing for Innovation

	Sources of Funds	Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Own Funds	141	59.5	60.8	60.8
	Loans	40	16.9	17.2	78.0
	External Partnerships – No funds	46	19.4	19.8	97.8
	External Partnerships - Funds	4	1.7	1.7	99.5
	Both own funds and loans	1	0.4	0.4	100.0
	Total	232	97.9	100.0	
Missing	System	5	2.1		
Total		237	100.0		

Source: Field Data, 2019

From the findings shown in Table 4.8, it can be seen that 5 respondents were categorised as MAR as the respondents erroneously left out the questions (de Leeuw et al., 2003). These item non-responses were omitted from this specific analysis. The findings in Table 4.8 show that the sources ranged from internally generated sources to externally generated ones. Accordingly, 59.5% of the respondent firms had their innovation funded by their own internal sources, whereas 17.3% was externally funded by loans from various sources. This was consistent with the finding by Radas and Bozic (2009), who argued that innovative activities in SMEs were mostly funded by internally generated sources.

In addition, 21.1% of the respondent firms stated that their innovation was funded by external partners and other investors, who occasionally required to be issued with equity in the firm. In the sample surveyed, four firms disclosed that they had received a direct financial interest injection by external partners that ranged from Kes.500,000/= to Kes.150 million for the firms. The findings were consistent with the findings of Freel (2000), who established that SMEs generally lacked awareness on alternative sources of finance for their innovative activities. This further suggested that there was an additional scope for external funding for innovation.

4.2.9 Challenges to Innovation in the Firms

The study also sought to understand the challenges that affect innovativeness. The responses were then themed into broad categories and are presented Table 4.9.

Table 4.9: Challenges to Innovation in the Firms

	Challenge	Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Contemporary Climatic Issues	1	0.4	0.5	0.5
	Customer Requirements	3	1.3	1.4	1.8
	Ethical Issues	11	4.6	5.0	6.9
	Finance	99	41.8	45.4	52.3
	Globalisation Effects	19	8.0	8.7	61.0
	Infrastructure	5	2.1	2.3	63.3
	Inherent Traits and Skills of Entrepreneur	17	7.2	7.8	71.1
	Macro Economy	6	2.5	2.8	73.9
	Market	23	9.7	10.6	83.4
	Products	7	3.0	3.2	87.6
	Regulatory Requirements	13	5.5	6.0	93.6
	Staff Requirements	6	2.5	2.8	96.3
	Technology	8	3.4	3.7	100.0
	Total	218	92.0	100	
Missing	System	19	8.0		
Total		237			

Source: Field Data, 2019

From the findings shown in Table 4.9, it can be seen that 19 respondents were treated as MAR as the respondents erroneously left out the questions (de Leeuw et al., 2003). These items were subsequently omitted from the specific analysis. The findings in Table 4.9 show that the challenges ranged from lack of finance, external market circumstances, inadequate and inappropriate staff capacity and skills, and unethical practices by some stakeholders, to abrupt regulatory requirements and many others. According to the findings, 45.4% of the respondents believed that lack of funds was a critical factor in innovation in their firms. These findings were consistent with those of Radas & Bozic (2009), which established that finance was the biggest obstacle to innovation in their study on Croatian SMEs. It was further shown in Table 4.8, that the source of funding was predominantly from own sources and these therefore created bottlenecks in innovation in the firms.

4.2.10 Patent and Trademark Registration with Firm

Commercialisation of innovation is best manifested through intellectual property protection by way of patenting and trademark registration of products, services and system changes with IP institutes. Once the intellectual property has been protected, the next stage is diffusion of the innovation. The study sought to establish the extent of commercialisation of innovation, of which the starting pointing was acquiring property rights. The findings are presented in Table 4.10.

Table 4.10: Patenting and Trademark Registration with IP Institutes

Response		Frequency	Percent	Valid Percent	Cumulative Percent
	No	92	38.8	42.0	42.0
Valid	Yes	127	53.6	58.0	100.0
	Total	219	92.4	100.0	
Missing	System	18	7.6		
Total		237	100.0		

Source: Field Data, 2019

From the findings shown in Table 4.10, it can be seen that 18 respondents were categorised as MAR as the respondents erroneously left the questions out (de Leeuw et al., 2003). These item non-responses were omitted from this specific analysis. Further to this, the findings in Table 4.10 show that 58% of the firms indicated that at one time or another, they had initiated the processes of registering and patenting their products with either KIPI, ARIPO or WIPO. The rest of the respondents had not made any efforts in registering or patenting their products. These findings were consistent with those of Kiveu (2012), who in a Kenyan study, established that 80% of the respondents had innovations that were not protected. In addition, 80% of those who had protected their innovation had similarly not commercialised their innovations.

There was not much indication as to what subsequently occurred in processing the patent or trademark because data from KIPI over the same period of time, did not show a correspondingly significant amount of successfully registered patent or trade-mark rights by small and medium enterprises. A review of the intellectual property rights registrations by KIPI (2019), revealed that over a period of 18 years, the number of resident-generated patent applications had improved from 23 to 244 over an 18-year period. The number of patents granted as of 2018 was 18. This compared to 628 that were applied for at ARIPO designed for Kenya and further compared to the 219 that were finally approved. The number of applications of registered trademarks by Kenyan residents was 2,624 against 3,654. Industrial designs by Kenyan residents were 170, but only 122 were approved, whereas utility model applications were 177 against the 32 that were registered.

The reasons for not initiating the processes were sought from those firms that had not attempted to register. Their responses were themed together and are summarised in Table 4.11.

Table 4.11: Reasons for Not Protecting through Intellectual Property Registration

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Knowledge	8	3.4	15.1	15.1
	Under Consideration	11	4.6	20.8	35.8
	Bureaucracy	9	3.8	17.0	52.8
	Expensive	9	3.8	17.0	69.8
	Market is Dynamic	3	1.3	5.7	75.5
	Not Interested	13	5.5	24.5	100.0
	Total	53	22.4	100	
Missing	System	184	77.6		
Total		237	100		

Source: Field Data, 2019

From the findings shown in Table 4.11, it can be seen that 184 respondents who comprised of 77.6% were treated as Missing by Design (MBD) as the respondents who answered in the affirmative in Table 4.10, were not meant to respond to these specific item (de Leeuw et al., 2003). These item non-responses were omitted from this specific analysis. The findings in Table 4.11 show that 15% of the respondents felt that they had a limited knowledge of the intellectual rights protection. Another 34% of the respondents felt that the process was bureaucratic and expensive. A further 25% were simply not interested. From the findings, the utilisation of intellectual property protection was not extensive. The reasons given were consistent with those, which were identified by Kiveu, (2012). These included a perceived long and tedious patenting process; numerous bureaucratic requirements for patenting; high costs of patenting and a perceived weak patent establishment in Kenya. Those who did not commercialise felt that there was limited knowledge on how to do it. They were faced with the challenge of funds to commercialise and that there was a lack of suitable markets for the patented products.

4.2.11 Relationship between Firm Profiles and Firm Innovativeness

The study assessed the relationships between the earlier stated descriptive profiles and firm innovativeness. Njiraini et al., (2018) used a similar approach to show that some characteristics influenced innovation decisions in micro and small enterprises. Measures of the correlations between these profiles against the consolidated number of innovation outcomes were determined. The item non-responses were omitted from the respective measurements. A summary of the findings of the correlation is provided in Table 4.12.

Table 4.12: Correlation between Firm Profiles and Innovativeness

Profile	N	Tests	Firm Innovativeness
Consolidated Number of Innovation (Product, Process, System)	215	Pearson Correlation	1
		Sig. (2-tailed)	
Year of Operation of Business	214	Pearson Correlation	-0.124
		Sig. (2-tailed)	0.07
Age of the Entrepreneur	214	Pearson Correlation	0.021
		Sig. (2-tailed)	0.761
Gender of the Entrepreneur	214	Pearson Correlation	0.039
		Sig. (2-tailed)	0.575
Number of staff	175	Pearson Correlation	.175*
		Sig. (2-tailed)	0.01
Firm's Annual sales for Past Year	214	Pearson Correlation	0.077
		Sig. (2-tailed)	0.271
Percentage creativity and innovation budget for the firm in the past year	206	Pearson Correlation	.312**
		Sig. (2-tailed)	0
Driving reasons for innovation in the business	202	Pearson Correlation	0.051
		Sig. (2-tailed)	0.468
Challenges to innovation	198	Pearson Correlation	0.054
		Sig. (2-tailed)	0.446
Proposer of the firm changes to the processes and products	185	Pearson Correlation	0.126
		Sig. (2-tailed)	0.087

*. Correlation is significant at the 0.05 level (2-tailed); **. Correlation is significant at the 0.01 level (2-tailed).

Source: Field Survey 2019

The findings in Table 4.12 showed that there was a correlation between two of the profile characteristics that were studied and firm innovativeness. These profile characteristics were the number of staff employed and the percentage creativity and innovation budget for the firm in the past year. This was similar to Njiraini et al., (2018) who showed that physical capital intensity, access to finance and size of the firm influenced innovation decisions. The correlation with the other characteristics were not found to be statically significant.

The level of correlation between maturity of the firm, which was determined by the number of years of operation and firm innovativeness was found to be negative and very weak. The correlation was also statistically insignificant. This study therefore did not find a correlation between maturity as defined and firm innovativeness. This contrasts findings by previous studies by Khan and Manopichetwattana (1989), Hausman (2005), Mazzarol, Reboud and Volery (2010), Ruiz-Ortega et al., (2013) and Njiraini et al. (2018) which indicated that there was a relationship between the number of years of operation and firms' innovativeness.

The correlation between the age of the principal entrepreneur and firm innovativeness in the study was also found to be weak. This was again dissimilar to studies by Jones and Weinberg (2011) and Kautonen (2012) that argued that there was a statistically significant relationship. This study concluded that inasmuch as some previous research had indicated a relationship between age and experience of entrepreneurs and number of years of operation of the firms to entrepreneurial orientation, there was no relationship between these factors and innovativeness.

Comparatively, there is no convergence on knowledge on the relationship between the said characteristics and innovativeness. In their study, Khan & Manopichetwattana (1989) established that there was a negative correlation between age and innovativeness of SME manufacturers. This position was further confirmed by other scholars, including Kautonen, (2012) and Ruiz-Ortega et al., (2013), who established that there was an inverse relationship between innovativeness and age. However other scholars, who included Jones & Weinberg (2011) have argued that there is a positive relationship between age and innovativeness.

The size of a firm is characterised by among others, available capital and the number of staff contracted by the firm. Previous studies have shown that a firm that has employed many staff has the flexibility, complexity and internally generated knowledge to be innovative (Hurley & Hult, 1998). The study sought to establish whether there is a relationship between the size of the firm and innovativeness. The correlation analysis indicated that the number of staff had a statistically significant relationship with innovativeness, R (175) = 0.175, $p < 0.05$. This was consistent with previous research findings by Radas and Bozic, (2009), Mazzarol et al., (2010) and Njiraini et al., (2018).

In their study on Croatian SMEs, Radas and Bozic (2009) argued that nimbler and smaller firms were more innovative. But on the basis of an exploratory study in Australia, France and Switzerland, Mazzarol et al, (2010) argued that the size of the firm contributed positively to innovativeness. It was also subsequently established that there was a non-linear association between innovativeness and the size of a firm (Kreiser, Marino, Kuratko, & Weaver, 2013). Scholars have also variously argued that the creation of an enabling environment for technological capability depended on the complexity of the firm (Tang & Lau, 2010; Salisu & Baker, 2018).

The relationship between the allocated and available resources dedicated to creativity and innovation was also considered. Availability of resources has been often been considered as critical in any firm processes (Wernerfelt, 1995). The results indicated that allocated and available resources for creativity and innovation had a moderate positive relationship with innovativeness, R (206) = 0.312, $p < 0.01$. This was consistent with the findings by Julienti Abu Bakar and Ahmad (2010) and Demirkan (2018). However, studies by Chandy and Tellis (2000) and Dougherty and Hardy (1996) pointed out that the prospective advantages of size are neutralised by the bureaucracy, lethargy and complexity generated beyond an optimal organisational level, leading to the suggestion by Martinez-Roman & Romero (2017), that the relationship between the size of firms and innovativeness could be curvillinear.

The study also sought to establish whether there was a correlation between annual sales turnover and innovativeness. The annual sales turnover was also considered as a dimension on the size of the firm. The results indicated a very weak relationship between the two. It was, however noted that higher levels of automation were observed in some of the firms that had higher turnover and as a result of which they were able to reduce their staffing levels. This study, therefore did not establish a relationship between annual turnover, automation and size of the respondent firms.

Although women owned less than 20% of the respondent firms, the study sought to confirm whether there was any correlation between gender and the level of innovativeness. No relationship was confirmed between gender and innovativeness, R (214) = 0.039, $p > 0.05$). Whereas the relationship between gender and innovativeness is not adequately conceptualised (Belghiti-Mahut, Lafont, & Yousfi, 2016), a study on Canadian SMEs by Rosa & Sylla (2016) established that in 2011, women majority-owned SMEs were more innovative than male majority-owned SMEs. This study found that the effect of gender on firm innovativeness was inconclusive.

According to the KNBS 2016 Survey, the mortality rates of start-up SMEs have been found to be very high in Kenya. This study focused on firms that were older than one year. After their survival in the initial years, the SMEs are still faced with a myriad of challenges they have to contend with for their survival. Consistent with the Schumpeterian Theory, organisations need to recreate themselves so that they may survive adverse operating conditions. The relationship between the years of operation and firm innovativeness in this study was inconclusive.

Mature firms have the ability to attract resources and staff who are skilled and competent enough to generate significant growth for them (Madhoushi et al., 2011; Kiveu, 2015). Mature firms similarly bank on their retained earnings and institutional knowledge reservoirs to drive innovation (Drucker, 1985; Chesbrough, 2003; de Beer & Armstrong, 2015). The study established a weak relationship between the number of staff in a firm and firm innovativeness. This relationship was statistically significant and confirmed that diversity of skills and experience affecting innovativeness. However, the study was not able to confirm that the firm’s annual sales turnover affected firm innovativeness.

A focus on innovativeness calls for a dedication on resources. These resources could be either tangible or intangible. The study was able to confirm a relationship between the firm’s creativity and innovation budget with innovativeness. This was a positive relationship indicating that the more funds are allocated and utilised for creativity and innovation, the more a firm is likely to be innovative. As discussed in Section 4.2.8, the main sources of funding of innovation were internally generated sources of funds. This placed a handicap on SMEs that were resource-constrained and unable to spur their innovative activities.

By the very nature of the word, an expectation on challenges to innovation would be that there should be an inverse relationship between it and firm innovativeness. There have been arguments that it is indeed, challenges that spur firms to become more, innovative. The findings on this relationship were inconclusive in this study as they were statistically insignificant. Comparatively, there are also inconclusive findings by scholars as to whether or not challenges acted as stimulants to innovativeness (Hadjimanolis, 1999; Katila & Shane, 2005; Radas & Bozic, 2009). The rationale about challenges acting as a stimulus for innovativeness implies that there is a behavioural disposition towards overcoming the challenges rather than letting them act as an impediment (Katila & Shane, 2005).

Changes to firm processes are often initiated at an individual level. Accordingly, as presented in Table 4.7, the study identified that in 62% of the firms, the initiator of these changes was the entrepreneur or senior management. This indicated a high level of centralisation in decision making in so far as innovativeness was concerned. Other possible initiators of change to innovativeness included the junior staff, customers or even the regulators. The study however, was not able to establish a significant relationship between the initiator of change and the level of innovativeness.

This study did not study the impact of intellectual property protection on innovativeness. This is because the findings in Table 4.10 showed that firms with an experience in IPR were limited to less than 54% of the sample surveyed and thus the findings would have been vulnerable to non-response bias. There is however little convergence of dialogue on the effect of intellectual protection in the developing countries (Reichman, 2009; Mrad, 2017). The discourse on the impact of intellectual property protections on firm innovativeness is equally divergent (Williams, 2010; Hussain & Terziovski, 2015; Ndicu, 2018).

The reasons for innovativeness have been previously explained as being behavioural, internal or external. There is a broad array of circumstances that fall under these three categories. Moreover, a correlational analysis of these reasons did not establish a relationship between many of these reasons and firm innovativeness. The study therefore, concluded that there was a need for further research with a specific focus on the identified variables and this is covered in Section 4.3.

4.3 Manifestation of the Study Variables

The survey also studied the manifestation of the study variables that affected firm innovativeness. Statements representing different construct items were presented to the respondents. The respondents scored between 1 and 5 for each statement representing a construct item, with 1 being lowest score of “Strongly Disagree” whereas 5 was the highest score at “Strongly Agreed”. For ease of data management, these statements were coded. A summary of the codes used in the statements appears in Appendix II. To have a better descriptive understanding of the scores on the statements, measures of central tendency and dispersion were obtained. In addition, measures of symmetry and peakedness of the distributions were obtained.

The measure of peakedness of the distribution was obtained through kurtosis (*k).* Kurtosis refers to the concentration of the distribution of the scores around the mean and when plotted on a graph, depicts the flatness of the curve. A high absolute kurtosis value indicates that there are more outliers in the distribution, whereas low absolute kurtosis value indicated fewer outliers in the distribution. A normal distribution is said to be at zero-kurtosis or mesocurtic. Negative values indicated a lower level of peakedness and such distributions were said to be platykurtic in behaviour. On the other hand, positive values indicated higher peakedness and distributions were said to be leptokurtic (Ho &Yu, 2015).

Measures of symmetry were determined by the skewness (*s*) of the scores. When plotted on a graph, skewness refers to the concentration of the frequency of the scores around the highest frequency. The distribution may appear as being strongly to the left, thus being said to be positively skewed. In such a case, mean value is higher than the highest frequency of occurrence (mode). The distribution may also be concentrated to the right, the distribution being said to be negatively skewed. In this case, the mean is less than the mode. A distribution that has an absolute value that is less than 0.5 is said to be fairly asymmetrical, whereas a distribution that is between 0.5 and 1 is said to be moderately skewed. A distribution whose absolute value is higher than 1.0 is said to be highly skewed (Ho & Yu, 2015).

For the purposes of the construction of the Structural Equation Measurement models, a factor analysis that allowed the reduction of the sub variables into fewer components was deemed necessary (Kim, 2008; de Winter & Dodou, 2015). To achieve this, the Principal Component Analysis (PCA) with 3-factor components was carried out. According to de Winter & Dodou, PCA strives to account for the highest amount of variance through the lowest number of components.

Prior to this, Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy was determined in each group of statements. Pallant (2005) recommended that measures above 0.5 were to be considered as adequate. In addition to this, the Bartlett's Test of Sphericity was also determined for each of the groups of statements. This was to confirm that the sub variables were not identity matrices, therefore unrelated and hence not suitable for factor reduction. The statistical significance of the values was obtained and according to Pallant, a p-value that was less than 0.05 was considered as significant.

Subsequently, multiple iterations were carried out to extract a reduced number of components. A number of scores which ranged between 0 and 1, were obtained which allowed a determination of the reducible components. A higher value or magnitude showed a strong relationship between the variable and the component, whereas a lower value showed a weaker relationship (Pallant, 2005). A negative value, indicated an inverse relationship between the variable and component. Using Kaiser's criterion, components that had an eigen value of 1 or more were isolated and subsequently through the use of Varimax Rotation with Kaiser normalisation, the component values were converted to less than 1.0 were adopted (Pallant, 2005). In addition to this, screeplots were extracted from SPSS and reviewed to identify the sharp bend thereby determining the component that was selected.

During the first stage of analysis, a number of item non-responses were identified after which clarification was sought from the respective respondents. Subsequently, at the second stage of analysis, a determination was made in each instance on the possible cause of the non-responses and remedial treatment was taken. Treatment was done in line with the recommendations of McDonald and Ho (2002) and de Leeuw et al., (2003) who posited that results from analysis of MCAR were not statistically biased, because there were no systemic differences between the respondents and the non-respondents.

De Leeuw et al. (2003) further argued that complications arose mainly in the area of reduced statistical power of the models derived. De Leeuw et al., however further posited that under analysis from MAR, serious bias may occur and therefore a need to take remedial action prior to analysis. All the item non-responses in the Section 4.3 and 4.4 were treated as MCAR which are ignorable under Maximum Likelihood Estimation that was used in this analytical model and therefore no further action was taken apart from acknowledging the response rates in the respective tables of outputs (McDonald & Ho, 2002; De Leeuw et al., 2003).

4.3.1 Entrepreneurial Orientation

Entrepreneurial orientation was defined by the study as the dispensation that allows a firm to behave in a manner that endures or overcomes current or future external events and shocks. Entrepreneurial orientation has been conceptualised as having several dimensions (George & Marino, 2011; Wach, 2015; Wales, 2016). Entrepreneurial orientation was defined as a second order construct and therefore tests were done on the first order constructs of the four dimensions namely, autonomy, proactiveness, risk taking and competitor aggression.

Autonomy was defined as the behavioural pattern that encourages independent opinion and action by an individual towards a specific goal. The test results on autonomy are as shown in Table 4.13.

Table 4.13: Descriptive Findings on Autonomy

Code	N	Mean	Standard Deviation	Kurtosis *(k)*	CV	Variance	Skewness *(s)*
EOA1	237	3.64	1.194	-.694	32.8%	1.426	-.467
EOA2	235	2.91	1.186	-.744	40.8%	1.407	.174
EOA3	236	3.23	1.060	-.495	32.8%	1.124	-.024
EOA4	236	3.49	1.105	-.355	31.7%	1.221	-.341
EOA5	237	2.81	1.174	-.556	41.8%	1.377	.352
EOA6	236	3.07	1.063	-.408	34.6%	1.131	.048
EOA7	231	3.94	.965	.113	24.5%	.932	-.648
EOA8	236	3.64	1.028	-.326	28.2%	1.057	-.393

Source: Field Data, 2019

The findings in Table 4.13 show that six out of the eight statements had mean scores that were above 3, indicating that the firms generally agreed that autonomy contributed to innovativeness. With the exception of one, all sub-variables in the dimension of autonomy were generally platykurtic in distribution. There was a general consensus that in their firms, the CEOs and the top management teams played a major role in identifying and selecting the entrepreneurial opportunities to be pursued. This was coded as EOA7, (M = 3.94, CV= 24.5%, s = -0.648, k = 0.113). This specific result pointed to the fact that the firm entrepreneurs or senior manager had an overbearing influence on productivity. This was consistent with previous research on autonomy with respect to key decisions (Lumpkin& Dess, 1996; Wiklund & Shepherd, 2005; Chang et al., 2011; Yi-Yang et al., 2011).

The respondents generally did not agree with the statement that the individuals in their firms referred to senior management to guide their work, although there was a small positive skew in their distribution. This was coded as EOA5, (M = 2.81, CV = 41.8%, s = 0.352, k = -0.556). This view was consistent with previous research that indicated that autonomy within a firm depended on its complexity (Lazzarotti & Manzini, 2009; Voeten, 2015).

In addition to this, PCA was carried out on the statements attributed to autonomy so as to reduce the statements into manageable number of components for use in structural equation modelling. The findings are presented in Table 4.14.

Table 4.14: Principal Component Analysis on Autonomy

Rotated Component Matrix[a]

	Component		
	1	**2**	**3**
In general, the top managers of our firm believe that the best results occur when individuals decide for themselves what business opportunities to pursue	0.776	0.109	0.132
Our firm supports the efforts of individuals that work autonomously	0.769	-0.204	-0.293
In our firm, employee initiatives and input play a major role in identifying and selecting the entrepreneurial opportunities the firm pursues.	0.594	-0.126	0.415
In our firm, individuals pursuing business opportunities make decisions on their own without constantly referring to their supervisor	0.555	-0.404	0.493
In our firm, individuals pursuing business opportunities are expected to obtain approvals from their supervisors before making decisions	-0.024	0.847	-0.011
Our firm requires individuals to rely on Senior managers to guide their work	-0.342	0.721	0.167
In our firm, the CEO and the top management team play a major role in identifying and selecting the entrepreneurial opportunities the firm pursues	0.228	0.574	0.474
In the firm the top managers of our firm believe that the best results occur when the CEO and top managers provide the primary impetus for pursuing business opportunities	-0.034	0.219	0.853
Initial Eigenvalues	2.464	2.023	0.883
Rotation Sum of Square Loadings (% of Variance)	25.301	23.086	18.740

KMO = 0.710; Bartlett's Test of Sphericity, χ^2 (28), 403.095, 0.000
Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.
a. Rotation converged in 5 iterations.

Source: Field Data

From Table 4.14, the KMO Measure on sampling adequacy returned a value of 0.710 which was considered adequate. Similarly, the Bartletts' Test of Sphericity yielded a p-value that was less than 0.05 thus indicating that the results were statistically significant and that the correlation matrix was not an identity matrix. Using the Varimax with Kaiser Normalisation Method, a rotated component matrix was obtained after 5 iterations. The components were further plotted on a screeplot which is presented as Figure 4.1.

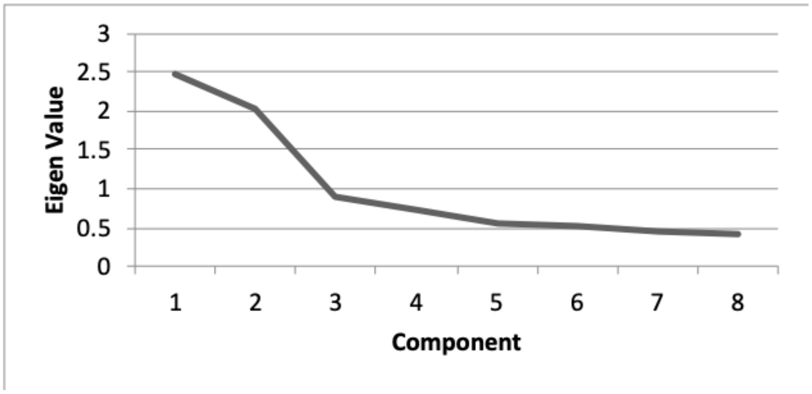

Figure 4.1: Scree Plot for Autonomy

From an observation of Figure 4.1, three components are shown as having eigen values that were above 1.0 and explained 67.13% of the loadings. Three statements were identified as statements EOA1, EOA3 and EOA8 and extracted for future use in the construction of the measurement model.

Proactiveness, defined by the study as the ability to predict future trends and changes, thereby suitably positioning themselves to capitalise on the available opportunities, was also measured. The findings on proactiveness are summarised in Table 4.15.

Table 4.15: Descriptive Findings on Proactiveness

Code	N	Mean	Standard Deviation	Kurtosis *(k)*	CV	Variance	Skewness *(s)*
EOP1	235	3.36	1.166	-.926	34.7%	1.360	-.053
EOP2	233	3.61	1.037	-.079	28.7%	1.076	-.483
EOP3	234	3.22	1.019	-.493	31.6%	1.038	.190
EOP4	219	3.00	.979	.003	32.6%	.959	-.128
EOP5	236	3.17	1.074	-.520	33.9%	1.154	.197
EOP6	236	2.81	1.054	-.249	37.5%	1.111	.067
EOP7	229	2.94	1.191	-.709	40.5%	1.417	.418

Source: Field Data, 2019

From the findings in Table 4.12, the respondents generally agreed with all the statements as evidenced by scores where 5 out of 7 statements were above 3 and the other 2 being slightly lower than 3. However, with the exception of one sub-variable, the distributions were generally platykurtic, indicating incidences of stark disagreement. In this exceptional case (EOP4), firms responded to actions by competitors, (*M*= 3.00, *CV*= 32.6%, *s*= -0.128, *k* = 0.003). This indicated that there was little disagreement that firms typically responded to actions that their competitors initiated. These findings mirrored those of a similar study by Kraus et al., (2012), which concluded that proactiveness positively affected SME performance and innovative SMEs performed better in a turbulent environment.

The firms surveyed were of the opinion that the top managers of their firms favoured an emphasis on the marketing of tried and tested products or services (*M*=3.61, *CV*= 28.7%, *s* = -0.483, *k* = -0.079). This was coded as Statement EOP2. The respondent firms neither agreed nor disagreed that their firms were very seldom the first businesses to introduce new products, services and other operating technology and techniques. This was coded as Statement EOP6 (*M* = 2.81, *CV*= 37.5%, *s* = 0.067, *k* = -0.249). This implied that a number of respondent firms were of the opinion that they were amongst the first to introduce new products, services and other operating technology. Other respondent firms however, were not of the same opinion. From this study, we cannot tell whether or not manufacturing SMEs adopt or generate completely new technology. This is consistent with the view that there is lack of consensus on whether or not SMEs adopt exploitative and exploratory innovation (Zhou & Wu, 2010).

Principal Component Analysis was similarly carried out on the statements that were used to measure the proactiveness sub-variable. The findings are shown in Table 4.16.

Table 4.16: Principal Component Analysis on Proactiveness

Rotated Component Matrix[a]

	Component		
	1	**2**	**3**
In dealing with competitors, our firm typically initiates actions which competitors then respond to.	0.807	-0.096	0.055
In dealing with competitors, our firm is very often the first business to introduce new products/services, administrative techniques, operating technologies, etc	0.789	0.079	0.002
Our company is the first to detect fundamental shifts in our industry (e.g., competition, technology, regulation).	0.698	0.12	-0.261
In general, the top managers of our firm have a strong tendency to be ahead of others in introducing novel ideas or products.	0.675	0.347	-0.054
In general, the top managers of our firm favour a emphasis on the marketing of tried and tested products or services	0.004	0.851	-0.127
Our firm is very seldom the first business to introduce new products/services, administrative techniques, operating technology etc etc	0.165	0.633	0.247
Our firm typically responds to actions which competitors initiates	-0.104	0.064	0.948
Initial Eigenvalues	2.430	1.216	0.936
Rotation Sum of Square Loadings (% of Variance)	32.207	18.268	14.986

KMO = 0.737; Bartlett's Test of Sphericity, χ^2 (21), 221.311, 0.000
Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization. a. Rotation converged in 5 iterations.
Source: Field Data, 2019

From the findings presented in Table 4.16, the KMO Measure yielded a value of 0.737 which was considered adequate. The Bartlett's Test of Sphericity yielded values that indicated that the results were less than 0.05 and therefore statistically significant and not an identity matrix. Similarly, Table 4.16 shows the findings on rotated component matrix after 5 iterations was derived. These components were further plotted on a screeplot shown as Figure 4.2.

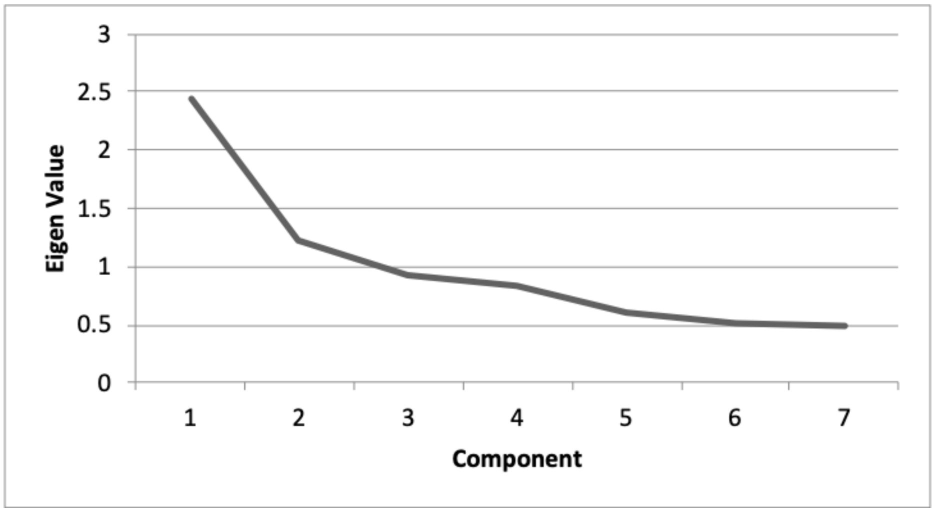

Figure 4.2: Scree Plot for Proactiveness

From an observation of Figure 4.2, three components are shown as having eigen values that were above 1.0 and explained 65.46% of the loadings. From these findings, three statements were extracted for further use in the structural equation model. These were Statements EOP3, EOP5, and EOP7.

Risk taking was defined as taking considered choices in uncertain environments that could result in unpredictable outcomes. The descriptive findings on risk taking are summarised in Table 4.17.

Table 4.17: Descriptive Findings on Risk Taking

Code	**N**	**Mean**	**Standard Deviation**	**Kurtosis *(k)***	**CV**	**Variance**	**Skewness *(s)***
EORT1	237	2.83	1.105	-.286	39.0%	1.220	.291
EORT2	237	3.00	1.141	-.710	38.0%	1.301	.061
EORT3	234	3.16	.912	.722	28.9%	.832	-.122
EORT4	235	3.57	.947	-.074	26.5%	.896	-.191
EORT5	235	2.97	1.141	-.497	38.4%	1.303	.198
EORT6	237	3.47	1.040	-.293	30.0%	1.081	-.200

Source: Field Data, 2019

The findings in Table 4.17 show that in as much as the average mean score was above 3.0 in 4 out of the 6 statements, the general spread of the responses was platykurtic in nature in all but one sub- variable. The exceptional statement EORT3 referred to firms on the basis of their environment, finding it best to explore and gradually change via timid incremental behaviour, (M = 3.16, CV = 28.9%, s = -0.122, k = 0.722). The implication is that the respondents neither agreed nor disagreed with the statement. The two statements (EORT1/EORT5) that had mean scores that were slightly below 3.0 were positively skewed, but with wide variations in this category. The results suggest a lack of consensus in these statements.

On this dimension, the respondents generally agreed that owing to the nature of their environment, bold, wide-ranging acts were necessary to achieve the firm's objectives. This statement was coded as EORT4, (M = 3.57, CV = 26.5%, s = -0.191, k = -0.074). On the other hand, there was a wide variance in their responses to the suggestion that they cautiously adopted a "wait-and-see" posture in order to minimise the probability of making costly decisions EORT5, (M=2.97, CV=1.303, s=0.198, k=-0.497). This further suggests that SMEs adopted both exploitation innovation as well as exploratory innovation due to the risk element. Consistent with previous research, risk taking is a measured activity rather than being an indefinite trial of new activities (Rauch, 2009).

Principal Component Analysis was also carried out on the risk-taking dimension statements. The findings on the PCA as presented in Table 4.18.

Table 4.18: Principal Component Analysis on Risk Taking

Rotated Component Matrix[a]	Component		
	1	2	3
Our firm has a strong proclivity for high risk projects (with chances of very high returns	0.797	-0.156	-0.033
Owing to the nature of the environment, bold, wide-ranging acts are necessary to achieve the firm's objectives.	0.757	0.159	0.108
When confronted with decisions involving uncertainty, our firm typically adopts a bold posture in order to maximize the probability of exploiting opportunities.	0.734	0.355	-0.076
Our firm has a strong tendency for lower risk projects (with normal and certain rates of return)	-0.018	0.821	0.028
Owing to the nature of the environment, our firm finds it best to explore it gradually via timid, incremental behaviour	0.177	0.647	0.134
Our firm typically adopts a cautious, 'wait and see" posture in order to minimize the probability of making costly decisions.	0.003	0.127	0.983
Initial Eigenvalues	1.983	1.240	0.844
Rotation Sum of Square Loadings (% of Variance)	29.643	21.407	16.742

KMO = 0.661; Bartlett's Test of Sphericity, χ^2 (15),146.831, .000

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization. a. Rotation converged in 4 iterations.

Source: Field Data, 2019

The findings in Table 4.18 showed that there was a KMO Measure of 0.661 which was considered as adequate. The Bartlett's Test of Sphericity indicated values that were less than 0.05, thereby implying that the data was statistically significant and was not an identity matrix. In addition to this, a rotated component matrix after 4 iterations, yielded 2 components and these were subsequently plotted on a screeplot which is shown as Figure 4.3.

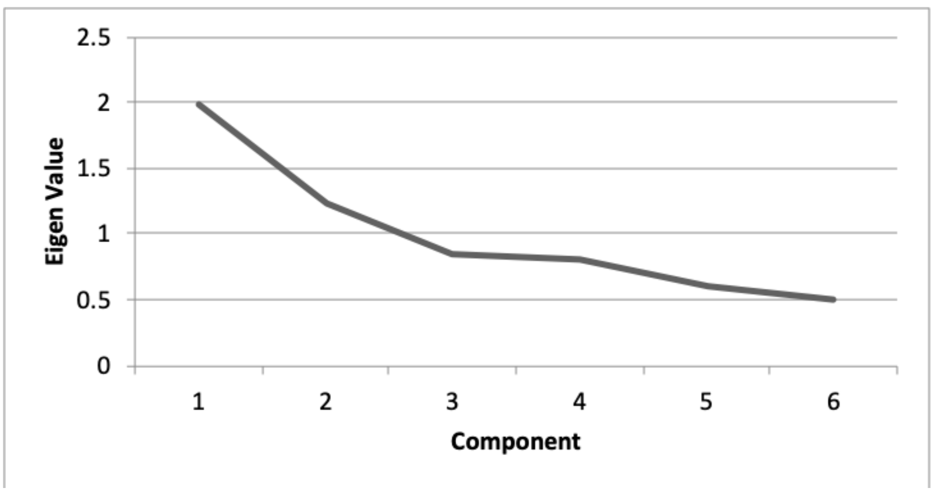

Figure 4.3: Scree Plot for Risk Taking

An observation on Figure 4.3 showed that 3 components had eigen values that were greater than 1.0 and explained 67.792% of the loadings. Subsequently Statements EORT2, EORT4 and EORT6 were extracted for use in the structural equation model.

Competitor Aggression was the next dimension that was measured. It was defined as the posture that a firm adopts to obtain a competitive advantage against their competitors. The results are summarised in Table 4.19.

Table 4.19: Descriptive Findings on Competitor Aggression

Code	N	Mean	Standard Deviation	Kurtosis (*k*)	CV	Variance	Skewness (*s*)
EOCA1	236	3.47	1.093	-.445	31.5%	1.195	-.260
EOCA2	231	3.90	.898	.554	23.0%	.807	-.702
EOCA3	236	3.29	1.028	-.006	31.2%	1.057	-.033

Source: Field Data, 2019

The findings in Table 4.19 show that all statements had mean scores that were above 3, and were all skewed negatively. All the three statements evaluated behaved differently in their distribution. Statement EOCA1 was on firms typically adopting a very competitive "undo-the-competitors" posture and was platykurtic in distribution. (*M* = 3.47, *CV* = 31.5%, *s* = -0.260, *k* =-0.445). The respondent firms surveyed agreed that their firms were generally aggressive and intensely competitive (*M*= 3.90, *CV* = 23.0%, *s* = -0.702, *k* = 0.554) implying that the respondents generally agreed on this statement EOCA2. Firms generally agreed on statement EOCA3 on firms seeking to avoid competitive clashes and preferring a "live" and "let live" environment, (*M*= 3.29, *CV* = 31.2%, *s* = -0.033, *k* = -0.006). From the results, most of the firms surveyed generally agreed with the measurements on the dimensions on entrepreneurial orientation with their scores being higher than 3.0. These concurrences were consistent with other research findings on competitor aggression (Wach, 2015).

A Principal Component Analysis was similarly carried out on the statements of the Competitor Aggression sub dimension. The findings are presented in Table 4.20.

Table 4.20: Principal Component Analysis on Competitor Aggression

Rotated Component Matrix[a]	Component		
	1	2	3
Our firm typically seeks to avoid competitive clashes, preferring a "live" and "let live" posture	0.995	0.058	0.086
Our firm typically adopts a very competitive "undo-the-competitors" posture	0.06	0.977	0.206
Our firm is very aggressive and intensely competitive	0.091	0.207	0.974
Initial Eigenvalues	1.509	0.903	0.588
Rotation Sum of Square Loadings (% of Variance)	33.372	33.346	33.282

KMO = 0.549; Bartlett's Test of Sphericity, χ^2 (3), 50.548, .000

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization. a. Rotation converged in 4 iterations.

Source: Field Data, 2019

The findings on Table 4.20, showed that the KMO Measure was 0.549. Though low, it was still quite acceptable as a measure of sampling adequacy, being above the cut-off of 0.5. The Bartlett's Test of Sphericity had a p-value of less than 0.05 thereby being adequate for the sample to be considered as statistically significant and therefore inference that there is no identity matrix. After 4 iterations, the rotated component matrix yielded 2 components which then plotted on a screeplot which is presented as Figure 4.4.

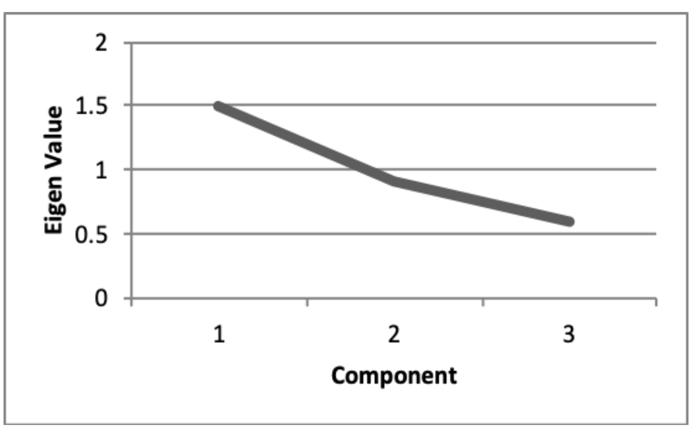

Figure 4.4: Scree Plot for Competitor Aggression

An observation of the scree plot showed that there were two components explaining 66.718% as having eigen values above 1.00. Subsequently, statements EOCA1 and EOCA3 were extracted for further use during the structural equation modelling.

4.3.2 Technological Capability

Technological Capability was operationalised in two ways. In the first instance, TC was measured using the actual investment in technology as well as the use of existing patents, licences and registered trademarks. These results obtained in the first instance were, however, established to be unreliable because firstly, the number of firms that completed them had a low response rate of 35%, and secondly, there was a wide variation on the number of registered patents/trademarks as well as the amount spent on investment. These variations were discussed in Section 4.2.3.

In the second instance, the study also used the positive organisational phenomena as a measure of the state of readiness for innovativeness within the sampled firms. These were organisational experiences that were deemed to encourage the innovation. They were measured by way of multi-items likert scales. The responses are presented in Table 4.21

Table 4.21: Descriptive Findings on Positive Organisational Phenomena

Code	N	Mean	Standard Deviation	Kurtosis *(k)*	CV	Variance	Skewness *(s)*
TCPOP1	237	4.09	1.085	.795	26.5%	1.178	-1.169
TCPOP2	236	3.30	1.151	-.689	34.9%	1.324	-.110
TCPOP3	232	3.35	1.054	-.347	31.5%	1.111	-.178
TCPOP4	231	1.99	.993	1.251	49.9%	.987	1.154
TCPOP5	233	3.85	.929	.020	24.1%	.864	-.499
TCPOP6	233	2.97	1.072	-.165	36.1%	1.150	.166
TCPOP7	226	2.93	1.085	-.448	37.0%	1.177	.163
TCPOP8	233	2.01	1.065	.540	53.0%	1.133	1.055
TCPOP9	220	3.40	.977	-.105	28.7%	.954	.123
TCPOP10	234	3.46	1.002	-.143	29.0%	1.005	-.126

Source: Field Data, 2019

From the findings shown in Table 4.21, the responses to the statements were varied with fairly high coefficients of variations (CV). The mean scores for the statements also ranged from 1.99 above 4.00. The mean score for statement TCPOP1 that the firms recruited staff who were academically and technically qualified, self-starters and also strong in originality in their respective assignments, was generally high, (M= 4.09, CV = 26.5%, s = -1.169, k = 0.795). This indicated a general agreement to the statement.

A similar study by Radas and Bozic (2009) suggested that highly academically and technically qualified staff had a positive impact on exploratory product innovation. On the other hand, Radas and Bozic did not establish a significant relationship between an inhouse research staff capacity and product innovation. This compares with this study, whereby a similar statement that the nature of innovation in the firm is mostly new innovation that had been untested elsewhere, TCPOP6 where the respondents neither agreed nor disagreed, (M = 2.97, CV = 36.1%, s = 0.166, k = -0.165).

Conversely, the study firms did not generally agree to the suggestion that they were slow to detect changes in their customer's product and service preferences, TCPOP4 (M = 1.99, CV = 49.9%, s = 1.154, k = 1.251). This was the same case with statement (TCPOP8) that the respondent firms rarely met with their customers to evaluate their marketing practices and understand the market and competitors, (M = 2.01, CV = 53.0%, s = 1.055, k = 0.540).

Principal Component Analysis was also carried out on positive organizational phenomena and the findings are presented in Table 4.22.

Table 4.22: Principal Component Analysis on Positive Organisational Phenomena

Rotated Component Matrix[a]

	Component		
	1	**2**	**3**
We incorporate and measure our input of our existing patents in the newly designed products	0.721	0.19	0.05
Our processes and service standards are designed such that they are a development over the previous standards	0.711	-0.004	-0.134
Our business plans are driven more by technological advances than by market research	0.686	-0.041	0.142
The nature of innovation in the firm is mostly new innovation that has been untested elsewhere	0.658	-0.047	-0.341
We recruit staff who are academically and technically qualified, strong in originality and are self-starters in their respective assignments	0.566	0.26	-0.104
Our company does a lot of in-house market research.	0.48	-0.187	-0.051
Our company rarely meets with our customers to evaluate our marketing practices and understand the market and competitors	0.235	-0.781	0.116
Our company frequently meets our customers to fine tune our marketing practices and keep up with the market and competitors.	0.293	0.687	0.139
The nature of innovation in the firm is adapted from other firm's practices or products	-0.036	0.212	0.736
Our company is slow to detect changes in our customers' product/ service preferences.	-0.089	-0.214	0.722
Initial Eigenvalues	2.709	1.314	1.190
Rotation Sum of Square Loadings (% of Variance)	26.313	13.163	12.657

KMO = 0.761; Bartlett's Test of Sphericity, χ^2 (45), 262.545, .000

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization. a. Rotation converged in 5 iterations.

Source: Field Data, 2019

From the findings on Table 4.22, the KMO Measure was 0.761, indicating adequacy of the samples for the component analysis. The Bartlett's Test of Sphericity returned a value of less than 0.05 thereby indicating statistical significance of the results. After 5 iterations, the rotated component matrix, isolated 3 components and these were plotted on a screeplot which is shown as Figure 4.5.

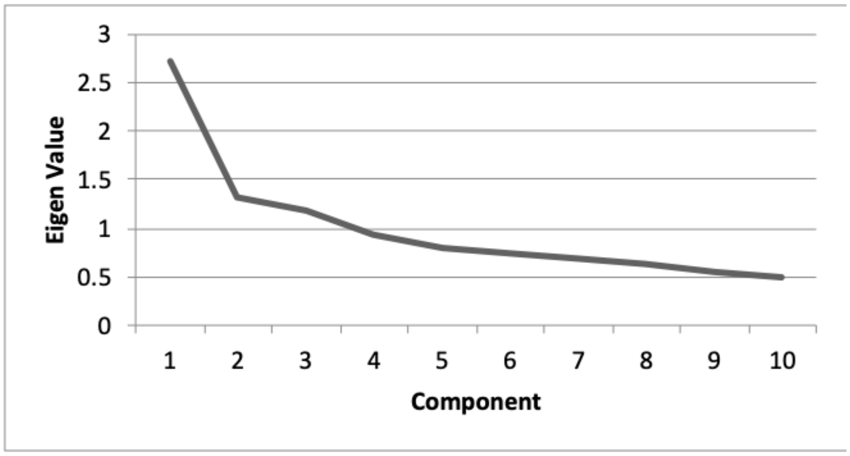

Figure 4.5: Scree Plot for Technological Capability

An observation of Figure 4.5, showed three components with eigen values that were above 1.0 and represented 52.133% of the loadings. Subsequently, three statements TCPOP9, TCPOP10 and TCPOP2 were extracted for future use in structural equation modelling.

4.3.3 Environmental Dynamism

The study also considered the effects of environmental dynamism on innovativeness. The effect of dynamism was categorised into four sub dimensions, which included socio-cultural aspects, regulatory framework, linkages, alliances and partnerships and finally available industry practices. The first sub dimension was on social cultural dimension and was coded as EDSC. These findings are shown in Table 4.23.

Table 4.23: Descriptive Findings on Socio Cultural Dimensions

Code	N	Mean	Standard Deviation	Kurtosis *(k)*	CV	Variance	Skewness *(s)*
EDSC1	237	3.89	1.150	.004	29.6%	1.322	-.838
EDSC2	236	2.56	1.456	-.992	56.9%	2.120	.641
EDSC3	233	3.00	.917	.658	30.6%	.840	.161
EDSC4	232	3.23	1.035	-.308	32.0%	1.071	.159

Source: Field Data, 2019

The findings in Table 4.23 indicated that firms favoured diversity in various socio-cultural backgrounds and encouraged the sharing of opinions in their business development (*M*= 3.89, *CV*= 29.6%, *s* = -0.838, *k* = 0.004). The firms though, were generally indifferent to the statement that tastes and preferences were easy to predict and forecast, EDSC3 (*M* = 3.00, *CV* = 30.6%, *s* = 0.161, *k* = 0.658).

The second sub dimension in environmental dynamism was the effect of the regulatory framework. These statements were coded as EDRF. These findings are presented in Table 4.24.

Table 4.24: Descriptive Findings on Regulatory Framework

Code	N	Mean	Standard Deviation	Kurtosis *(k)*	CV	Variance	Skewness *(s)*
EDRF1	234	2.09	1.093	.845	52.3%	1.194	1.103
EDRF2	236	3.78	1.147	-.375	30.3%	1.315	-.643

Source: Field Data, 2019

The findings in Table 4.24 show that the firms did not agree to the suggestion that they had very little interactions with regulators. The statement was coded as EDRF1, (*M*= 2.09, *CV* = 52.3%, *s* = 1.103, *k* = 0.845). On the other hand, the responses on statement EDRF2 indicated that they had frequent interactions with the industry regulators and legislators to influence policy and legislative changes, (M= 3.78, CV = 30.3%, s = -0.643, k = -0.375). These findings suggest that some level of external interaction and networking with the regulators is critical for development of innovation.

The study also studied the third subdimension of environmental dynamism which was identified as linkages, alliances and partnerships. This was coded as EDLAP and the statement responses are presented in Table 4.25.

Table 4.25: Descriptive Findings on Linkages/Alliances and Partnerships

Code	N	Mean	Standard Deviation	Kurtosis ***(k)***	CV	Variance	Skewness ***(s)***
EDLAP1	232	3.50	.967	-.471	27.6%	.935	.101
EDLAP2	231	3.45	.994	.006	28.8%	.987	-.211
EDLAP3	228	2.52	1.174	-.441	46.6%	1.378	.557
EDLAP4	228	3.14	1.120	-.486	35.7%	1.255	-.043
EDLAP5	228	2.55	1.235	-.515	48.4%	1.526	.649
EDLAP6	226	3.33	1.189	-.423	35.7%	1.414	-.523

Source: Field Data, 2019

From the findings in Table 4.25, the responses indicated that firms generally regularly entered into mutually beneficial networks, alliances and partnerships with the sole purpose of driving innovation in the industry. This statement was coded as EDLAP1, (M= 3.50, CV = 93.5%, s = 0.101, k =-0.471). The findings also indicated some firms regularly collected industry information though informally EDLAP2, (M=3.45, CV = 28.8%, s = -0.211, k = 0.006). A study by Radas and Bozic (2009) established that the collaboration between the firms and other organisations had a positive significant impact on exploitative and incremental innovativeness. There was however a weak relationship on radical innovation.

The responses in this section also suggested that there was no consensus on organisations participating with larger private firm research-driven initiatives, EDLAP3, (*M*=2.52, *CV* = 46.6%, *s* = 0.557, *k* = -0.441). The statement on public sector-driven research initiatives, coded as EDLAP5 indicated that the respondents generally did not agree with the suggestion that they do not participate in public sector-driven initiatives, (*M*= 2.55, *CV* = 152.6%, *s* = 0.649, *k* = -0.515). This was consistent with the earlier finding that firms generally like to network. The study by Radas and Bozic (2009) however, suggested that public research and development had a strong positive effect on radical innovation. Keizer et al., (2002) also argued that innovation in SMEs was affected by among other things, available opportunities in the external environment.

The survey also measured statements on available industry practices as affecting environmental dynamism. The findings are presented in Table 4.26.

Table 4.26: Descriptive Findings on Available Industry/Practices

Code	N	Mean	Standard Deviation	Kurtosis *(k)*	CV	Variance	Skewness *(s)*
EDAIP1	233	2.66	1.277	-.689	48.0%	1.632	.503
EDAIP2	228	3.14	.998	.035	31.8%	.997	.242
EDAIP3	234	2.85	1.027	.174	36.0%	1.055	.520
EDAIP4	234	2.38	1.232	-.472	51.8%	1.517	.651
EDAIP5	234	3.17	1.020	-.112	32.2%	1.041	.247
EDAIP6	236	2.31	1.146	-.610	49.6%	1.314	.388

Source: Field Data, 2019

The findings in Table 4.26 show that four out of the six statements had platykurtic responses. All the response statements also elicited positive skews in their responses. The statement EDAIP5 indicated that the volume of products and services to be delivered changed fast and often, (*M*= 3.17, *CV* = 32.2%, *s* = 0.247, *k* = -0.112). Similarly, the statement EDAIP2 on the mode of production and service changing often and in a major way suggested that there was a general agreement by the firms on the changes (*M*= 3.14, *CV* = 31.8%, *s* = 0.242, *k* = 0.035). Statement EDAIP3 that indicated that the rate at which products/services were getting obsolete in the industry was slow, was not generally accepted, (*M*= 2.85, *CV* = 105.55%, *s* = 0.520, *k* = 0.174).

The responses from the firms did not agree to the suggestion that the rate of obsolescence as being very high in the industry. This statement was coded as EDAIP4, (*M*= 2.38, *CV* = 51.8%, *s* = 0.651, *k* = -0.472). This finding was different from previous research findings by O'Regan & Ghobadian, 2005; Yi-Ying, 2011 that indicated that environmental turbulence was characterised by dynamic technological shifts and shorter product life cycles that led to product obselescence. Furthermore, a review of previous studies indicated that environmental dynamism affected firm innovativeness (Khan & Manopichetwattana, 1989; Chang et. al., 2011; Staniewski et al., 2016; Pustovrh et al., 2017; Musawa & Ahmed 2018, Zhai et al., 2018).

4.3.4 Firm Innovativeness

Firm Innovativeness was defined as the level of openness and pursuit of new ideas in a firm’s products and processes. Three statements were used to measure the firm’s proclivity towards new products, risk management and proactivity. The findings are presented in Table 4.27.

Table 4.27: Descriptive Findings on Firm Innovativeness

Code	N	Mean	Standard Deviation	Kurtosis *(k)*	CV	Variance	Skewness *(s)*
FI1	162	3.75	.871	-1.023	23.2%	.759	.104
FI2	200	3.77	.839	-.572	22.6%	.703	.002
FI3	200	3.79	.830	-.900	21.9%	.689	.038

Source: Field Data, 2019

From the findings in Table 4.27, 162 firms responded to the first statement and were of the opinion that there was a moderate emphasis on the level of firm innovativeness. The findings also showed that there was a marginal preference for explorative innovation compared to the exploitative emphasis. This statement was coded as FI1, (*M*= 3.75, *CV*= 23.2%, *s* = 0.104, *k* = -1.023). According to the second statement (FI2), there was also an indication of a marginal propensity towards risk taking by way of churning out new products (*M*= 3.77, *CV*= 22.6%, *s* = 0.104, *k* = 0.839). There was also a tendency to monitor and make changes to the product lines over time (FI3), (*M* = 3.79, *CV* = 21.9%, *s* = 0.038, *k* = -0.900). The levels of asymmetry were well below 0.5, indicating that descriptive scores on the dependent variable was fairly asymmetric and therefore good for generalisability (Pallant, 2005; Ho & You, 2015).

A principal component analysis was carried out on the statements of firm innovativeness. The findings are indicated in Table 4.28 below.

Table 4.28: Principal Component Analysis on Firm Innovativeness

Rotated Component Matrix[a]

	Component		
	1	**2**	**3**
In my firm, there exists a very strong emphasis on R&D, technological leadership, and innovations	0.971	0.133	0.200
In my firm, more than half of our product lines or services were introduced during the past three years	0.142	0.939	0.313
In my firm, changes in product lines have been major over the last three years	0.232	0.336	0.913
Initial Eigenvalues	1.954	0.700	0.346
Rotation Sum of Square Loadings (% of Variance)	33.870	33.768	32.362

KMO = 0.613; Bartlett's Test of Sphericity, χ^2 (3), 103.298, .000

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization. a. Rotation converged in 5 iterations.

Source: Field Data, 2019

As shown in Table 4.28, a principal component analysis on the variable yielded a KMO Measure of 0.613 which was considered adequate. The Bartlett's Test of Sphericity had a p-value that was less than 0.05 thereby indicating statistical significance of the samples. After 5 iterations, the rotated component matrix, isolated 3 components and these were plotted on a screeplot. This is presented as Figure 4.6.

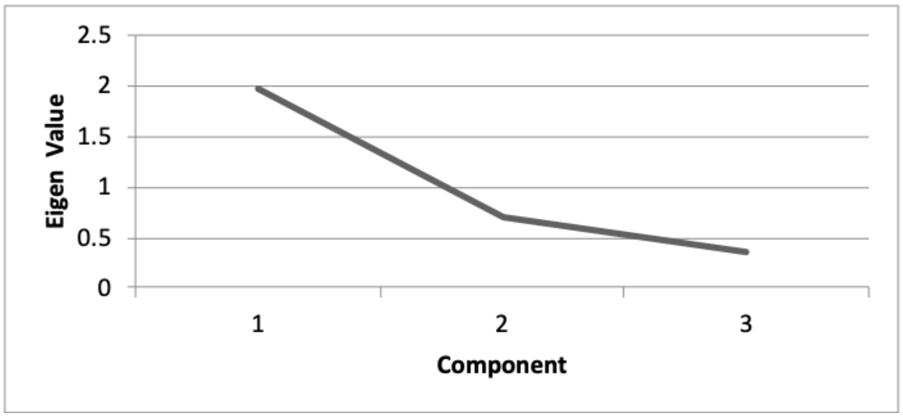

Figure 4.6: Firm Innovativeness Scree Plot

As observed in Figure 4.6, the screeplot indicated that two components returned eigen values that were higher than 1.0 and explained 67.638% of the loadings. Subsequently, the two statements, FI1 and FI3 were extracted for further use in structural equation modelling.

4.4 Tests of Hypothesis

The study had a general objective of establishing, analysing and determining the effect of entrepreneurial orientation, technological capability and environmental dynamism on firm innovativeness within manufacturing SMEs in Nairobi County. The study had the following specific objectives; to establish the relationship between entrepreneurial orientation and firm innovativeness of manufacturing SMEs in Nairobi; to assess the mediating effect of technological capability on the relationship between entrepreneurial orientation and firm innovativeness of manufacturing SMEs in Nairobi; to determine the moderating effect of environmental dynamism on the relationship between entrepreneurial orientation and firm innovativeness of manufacturing SMEs in Nairobi; to establish the joint effect of entrepreneurial orientation, environmental dynamism, and technological capability on firm innovativeness of manufacturing SMEs in Nairobi.

These objectives were defined into various hypotheses for testing. To validate the hypotheses, inferential analysis was used to model various regression equations, which were then tested for correlation and significance. To study the effect of EO on FI, a multiple regression model was formulated, whereas to study the intervening effect of TC on the relationship between EO and FI, structural equation modelling was used. To study the moderating effect of ED on the relationship between EO and FI, a hierarchical regression model was used. Finally, to study the joint effect of EO, TC, and ED on FI, a multiple regression model was applied.

In addition to this, the coefficients of correlation (R) were obtained and analysed in each of the models. The correlation coefficient R-value indicated the strength of the relationship between the variables and ranged from -1 to +1. A relationship is deemed to be strong when the absolute R-value is higher than 0.5 (Pallant, 2005). Absolute R-values that are between 0.3 and 0.5 are said to be indicative of moderate relationships whereas according to Pallant (2005), a relationship is said to be weak when the absolute R-value is below 0.3, with the values that are close or equal to 0 indicating very weak or no relationship. When the R-value is negative, the relationship is inversely related. The converse is true (Hagquist & Stenbeck, 1998).

The coefficients of determination (R^2) and adjusted coefficients of determination ($Ra^{2)}$ were also obtained. The R^2 value indicates the goodness of fit and shows how well the independent variables explain the dependent variable (Pallant, 2005). The higher the value, the better the explanation. Low R^2 values imply that there are higher variations of the variables from the regression model. A high R^2 value indicates a low variation of the variables and therefore the relationship model explains more of the variables. The Ra^2 takes into account the number of variables and if its closer to 1 than the unadjusted R^2, then it means a previous under-fitting of the model. If the Ra^2 is further from 1 than the unadjusted R^2, implies a previous over-fitting of the model (Hagquist & Stenbeck, 1998).

The relationships were tested at 95 per cent confidence level, after which a decision to confirm or reject the various hypothesis was made. The *F*-statistic indicates the significance of the overall study model and indicates whether your linear model provides a better fit to the data than a model that does not contains any independent variables. If the computed *F*-statistic was greater than critical F-statistic, and where the *p*-value was less than 0.05, the relationship was deemed to be statistically significant and the alternate hypothesis was not rejected. The *t*-values indicate the significance of the independent variables in the study. Where the *t*-value for the individual variable was greater than 0.05, then the independent variable was deemed to be statistically insignificant.

In the regression equations, the beta coefficient indicates the effect of the independent variable on the dependent variable (Pallant, 2005). The value of the intercept indicated the value of the dependent variable in the model when all independent variables were zero. The findings of the regression models, the hypothesis tests and a subsequent discussion on the same are presented in the sections that follow.

4.4.1 Entrepreneurial Orientation and Firm Innovativeness

As a sequel to the first specific objective, the study sought to establish the relationship between entrepreneurial orientation and innovativeness. The following hypothesis was examined; -

H_0: *Entrepreneurial Orientation does not significantly affect Firm Innovativeness in Manufacturing SMEs*

H_1: *Entrepreneurial Orientation significantly affects Firm Innovativeness in Manufacturing SMEs*.

Regression equations were modelled to test the independent effect of entrepreneurial orientation on firm innovativeness. Being a second order construct, entrepreneurial orientation was dimensioned into autonomy, proactiveness, risk taking and competitor aggression. Two models were derived and tested.

In the first instance, the relationship was modelled on the basis of disaggregated dimensions, which included the earlier stated dimensions as the predictors and the model summary is presented in Table 4.29.

Table 4.29: Effect of Entrepreneurial Orientation Dimensions on Firm Innovativeness

Model Summary				
Model	**R**	**R Square**	**Adjusted R Square**	**Std. Error of the Estimate**
1	.361[a]	0.13	0.111	.64291

ANOVA[a]						
Model		**Sum of Squares**	**df**	**Mean Square**	**F**	**Sig.**
1	Regression	11.004	4	2.751	6.655	.000[b]
	Residual	73.574	178	0.413		
	Total	84.577	182			

Notes: MODEL SUMMARY a. Predictors: (Constant), Competitor Aggression, Proactiveness, Risk Taking, Autonomy; ANOVA a. Dependent Variable: Firm Innovativeness, b. Predictors: (Constant), Competitor Aggression, Proactiveness, Risk Taking, Autonomy

Source: Field Data, 2019

The findings in Table 4.29 suggest a moderate relationship between the independent and dependent variables, R = 0.361. According to Pallant (2005), coefficients of correlations that are greater than 0.3 are acceptable. The coefficient of determination showed a low variability of the variables around the regression line, R^2 = 0.13. The adjusted findings of the coefficient of determination suggest an over-fitting of the original model, Ra^2 = 0.111. This implied that 11.1% of firm innovativeness was explained by the independent variables in the model. Inasmuch as the R^2 values are low, this is not uncommon in social sciences, as they are mostly predicated on human behaviour which is often unpredictably immeasurable (Moksony, 1990; Hair, Ringle, & Sarstedt, 2013). This position was also adopted by several other scholars (Rigtering, 2013; Kithusi, 2015; Wekesa, 2015).

Given that F (4,182) = 6.655, $p < 0.05$ was greater than $F_{Critical}$ (4,182) = 2.4213, $p <$ 0.05 it was concluded that overall model was statistically significant. The inference was that entrepreneurial orientation had a significant effect on firm innovativeness. The complete equation coefficients and variables for the model are presented in Table 4.30.

Table 4.30: Coefficients for Disaggregated Predictors Regression Model

		Coefficients[a]				
		Unstandardised Coefficients		Standardised Coefficients		
Model		B	Std. Error	Beta	t	Sig.
1	(Constant)	2.069	.398		5.197	.000
	Autonomy	.200	.135	.139	1.486	.139
	Proactiveness	.085	.112	.069	.765	.445
	Risk Taking	.249	.116	.201	2.154	.033
	Competitor Aggression	.032	.088	.028	.366	.715

a. Dependent Variable: Firm Innovativeness

Source: Field Data, 2019

The findings in Table 4.30 suggests that all predictors have a positive impact on the dependent variable. According to the model, when all variables are zero, the firm innovativeness would be 2.069. The table further suggests that risk taking has the highest impact on firm innovativeness and is statistically significant. A single unit change in risk taking, *ceteris paribus* will affect a change of 0.201 in firm innovativeness. On the other hand, autonomy, proactiveness and competitor aggression as dimensions, have the positive coefficients but these findings are, however, not statistically significant. Whereas individually autonomy, proactiveness and competitor aggression are not statistically significant, when combined with the risk-taking dimension, the overall consolidated model becomes statistically significant.

The first regression equation is, therefore, modelled as; -

$$Y_1=2.069 + 0.0.200X_1 + 0.085X_2 + 0.249X_3 + 0.032X_4$$

Where; - Y_1 = Firm Innovativeness; X_1 = Autonomy; X_2 = Proactivity; X_3 = Risk Taking; X_4 = Competitor Aggression

Methodologically, there would be an inclination of dropping the variables, which are statistically insignificant. In the above equation, this would include X_1, X_2 and X_4. This view is no longer valid as statisticians have argued that this action involves moving away from the maximum likelihood solution, thereby creating a sub-optimal model (Wasserstein & Lazar, 2016; Heinze & Dunkler, 2017). The argument goes that the independent variables could actually end up being statistically significant when the confidence interval is expanded from say, 95% to 90% (Goodman, 2008; Greenland, et al., 2016). Dropping such variables places the study under the risk of committing a Type II error (Gagnier, 2017).

Moreover, the study findings indicate that the individual variables have a significant interacting effect, thereby affecting the dependent variable. The study therefore avers that the relationship between the individual dimensions of entrepreneurial orientation varies differently. In addition to this, changes to the dimensions may ultimately affect the overall balance of the relationships within and impact on entrepreneurial orientation. The relationship was also modelled on the basis of a composite score for Entrepreneurial Orientation. The model summary is presented in Table 4.31.

Table 4.31: Effect of Entrepreneurial Orientation on Firm Innovativeness

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.345a	.119	.114	.64166

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	10.056	1	10.056	24.423	000b
	Residual	74.522	181	0.412		
	Total	84.577	182			

Notes: MODEL SUMMARY a. Predictors: (Constant), Composite score for Entrepreneurial Orientation. ANOVA a. Dependent Variable: Firm Innovativeness b. Predictors: (Constant), Composite score for Entrepreneurial Orientation

Source: Field Data, 2019

From the findings in Table 4.31, the new model, there is a moderate relationship even though the model is slightly weaker than the disaggregated one, R = 0.345. Similarly, a coefficient of correlation that was greater than 0.3 was considered as acceptable (Pallant, 2005). The coefficient of determination was weak but comparatively acceptable (Rigtering, 2013; Kithusi, 2015). Nevertheless, the model had a better fit than the unadjusted model, (Ra^2 = 0.114). In spite of this, the overall composite model was still statistically significant, F (1,182) = 24.423, $p < 0.05$. These were consistent with the previous research findings (Hult, et al., 2004; Avlonitis & Salavou, 2007; Renko et al., 2009; Perez-Luno et al., 2010). Comparatively, entrepreneurial orientation was also found to act as a mediating variable in the relationship between knowledge management and innovation performance (Madhoushi et al., 2011).

The variables were then modelled into a multiple regression equation and the coefficients for the derived model are presented in Table 4.32.

Table 4.32: Coefficients for Effect of Entrepreneurial Orientation on Firm Innovativeness

Coefficients[a]

Model		Unstandardised Coefficients		Standardised Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.996	.384		5.194	.000
	Composite score for Entrepreneurial Orientation	.581	.118	.345	4.942	.000

a. Dependent Variable: Firm Innovativeness

Source: Field Data, 2019

From the findings in Table 4.32, the study confirms that holistically, entrepreneurial orientation affects innovativeness. It also suggests that over and above entrepreneurial orientation, there are other variables that affect innovativeness within manufacturing SMEs.

The resultant equation is therefore as shown below; -

$$Y_1 = 1.996 + 0.581X$$

Where: X = Composite Score for Entrepreneurial Orientation

Furthermore, given that F (1,182) = 24.423, $p < 0.05$ was greater than $F_{Critical}$ (1,182) = 3.8931, $p < 0.05$ it was concluded that overall model was still statistically significant. As a result of this, *the study failed to reject the hypothesis that Entrepreneurial Orientation significantly affects Firm Innovativeness in Manufacturing SMEs in Nairobi County, Kenya.*

4.4.2 Entrepreneurial Orientation, Technological Capability and Firm Innovativeness

As a consequence of the second objective, the study also sought to establish whether there is an intervening influence of technological capability on the relationship between entrepreneurial orientation and firm innovativeness on manufacturing SMEs in Nairobi. Structural equation modelling was used whereby three measurement and thereafter three structural equations were modelled and tested for significance. SEM is widely accepted to have the power to measure the reliability and validity of multi-item constructs whilst testing structural model relationships (Hair et al., 2017). The measurement models comprised of the dimensions of the latent constructs. The structural model in turn specified the inter-relationships between the latent constructs (Arbuckle, 2013). Through SEM, a simultaneous assessment of the measurement model and the structural model was done. The study used the SPSS AMOS 22 software to analyse the data.

4.4.2.1 Measurement Model

The three study variables, entrepreneurial orientation, technological capability and firm innovativeness were considered as latent constructs and various applicable statements were used to measure them. The measurement models specified the relationship between the statement response items and the underlying constructs. The statements responses were reduced through PCA (Kim, 2008; de Winter & Dodou, 2015) and the resultant components were presented in Section 4.3.1. To construct the model, a path diagram for a recursive model was first designed and this is schematically shown as Figure 4.7.

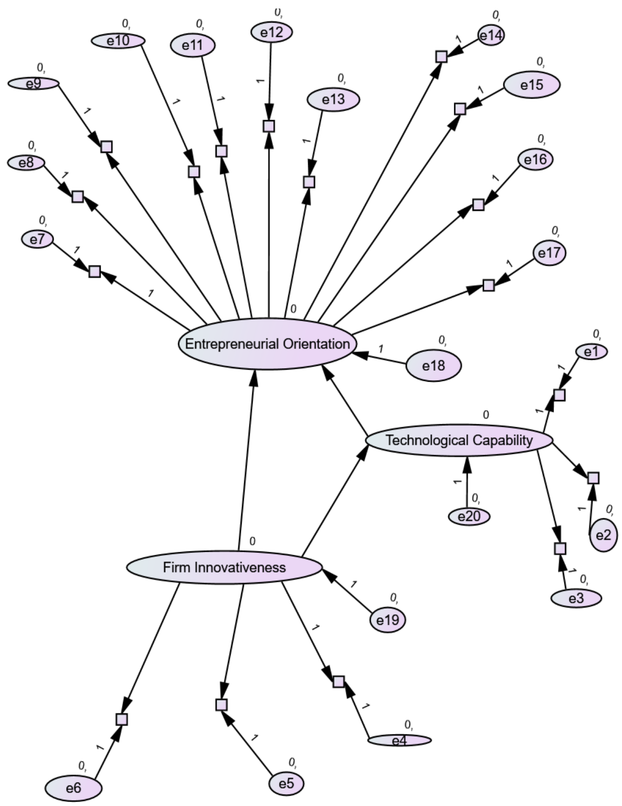

Figure 4.7: Initial Base Path Diagram
Source: Field data, 2019

An observation of Figure 4.7 shows that the proposed base model had three unobserved endogenous variables, 17 observed endogenous variables and 20 unobserved exogeneous variables. Thereafter, the relationships across the various variables were modelled. In the first instance, the base model was rejected because its goodness for fit indices *(χ^2 = 235 (80), 0.000)* were deemed as invalid. Subsequently, the model was corrected by way of shedding of some components as well as consideration of additional correlations (Hooper, Coughlan, & Mullen, 2008; Arbuckle, 2013). The modification indices were not adjusted and were left at the default level in the study. The corrections created a new path diagram that is shown as Figure 4.8.

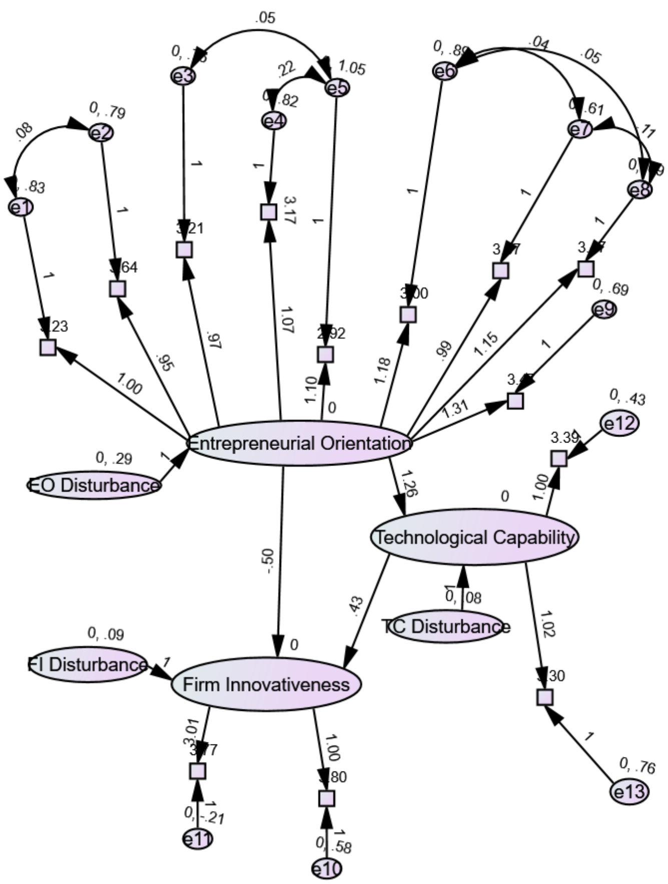

Figure 4.8: Remodelled Base Path Diagram
Source: Field data, 2019

From Figure 4.8, it can be observed that the model retained three unobserved endogenous variables, 13 observed endogenous and 16 unobserved exogenous variables. This is because four components had been shed off. These components were from statements EOA1, EOCA3, TCPOP10 and FI2 which were shed off on the basis of having the lowest value of squared multiple correlations, R^2. The determination of the statements to be deleted was also simultaneously confirmed by the use of *a priori* theory. As an attestation of construct validity, the corrected base model achieved satisfactory goodness of fit measures. A summary of fitness indices for the default corrected model is presented in Table 4.33.

Table 4.33: Fitness Index Assessment for the Remodelled Path Diagram

Index	Index Value	Cut off Value	Comment
Absolute Fit Indices			
Chi Square (χ^2)	99.667 (56, 0.000)	Sig > 0.05	Required Level is not achieved
Root Mean Square Error of Approximation (RMSEA)	0.057	<0.08	Required level is achieved
Incremental Fit Indices			
Comparative Fit Index (CFI)	0.935	>0.9	Required level is achieved
Incremental Fit index (IFI)	0.938	>0.9	Required level is achieved
Parsimony Fit Indices			
Parsimony Normed Fit Index (PNFI)	0.535	> 0.5	Required level is achieved
Wheaton's Chi Square ((χ^2/df)	1.78	< 5.0	Required level is achieved

Source: Field Data, 2019

From the findings in Table 4.33, there is a discrepancy between the findings of the Chi Square and the rest of the fitness indices. The use of chi square as a fitness statistic has a number of limitations. One of the limitations is that the Chi-square statistic hardly works well with large samples and secondly, any deviations from normality subsequently result in model rejections (Hooper et al., 2008). Other fit indices are not as sensitive to sample sizes and their outcome were all considered to be acceptable (McDonald & Ho, 2002; Hooper et al, 2008; Arbuckle, 2013). As a result of this, the study resorted to accept the remodelled path diagram on the basis of the other recommended indices that were also presented in Table 4.32.

In addition to this, the study sought to evaluate the measurement model for validity, reliability and uni-dimensionality (Drost, 2011). Reliability was determined by an assessment of the internal reliability through the use of the Cronbach's Alpha Coefficient and the determination of the Composite Reliability (CR) also commonly referred to as the Coefficient Omega (Padilla & Divers, 2016). Cronbach's Alpha coefficient for the construct had previously been calculated and was earlier presented in Table 3.3. It is presented again, alongside other measures for reliability in Table 4.34.

Table 4.34: Confirmatory Findings for the Measurement Model

Construct	Item	Factor Loading	Cronbach Alpha	Composite Reliability
Entrepreneurial Orientation	EOA1	Deleted due to low factor loading		
	EOA3	0.776		
	EOA8	0.769		
	EOP3	0.807		
	EOP5	0.789		
	EOP7	0.698	0.805	0.812
	EORT2	0.797		
	EORT4	0.757		
	EORT6	0.734		
	EOCA1	0.995		
	EOCA3	Deleted due to low factor loading		
Technological Capability	TCPOP2	0.721	0.553	0.678
	TCPOP9	0.711		
Firm Innovativeness	FI1	0.971	0.724	0.591
	FI3	0.232		
	FI2	Deleted due to low factor loading		

Source: Field data, 2019

According to the findings in Table 4.34, the Cronbach's Alpha tests met the required threshold of 0.5 (Pallant, 2005; Sekaran & Bougie, 2013). The CR for entrepreneurial orientation and technological capability were above the threshold of 0.6, whereas that of firm innovativeness was slightly below at 0.591. On the basis of Cronbach's coefficients, these findings were considered as acceptable for the reliability of the model.

In addition to the steps taken in Section 3.8.1, the study assessed the convergent validity through the use of the Average Variance Extracted (AVE). Discriminant validity referred to the extent to which the statements measurements differentiated unrelated constructs (Hair et al., 2017) and was determined on the basis of redundancies. Four statement items (EOA1, EOCA3, TCPOP10 and FI2) with low factor loadings were deleted from the model and made redundant. The Fornell-Larcker criterion was used to assess discriminant validity wherein the AVE was compared to the squared correlation between the constructs (Hair et al., 2014). A summary of the AVE and validity matrix findings is presented in Table 4.35.

Table 4.35: Average Variance Extracted and Fornell-Larcker Criterion Assessment

Variable	**Average Variance Extracted**	**Discriminant Validity Matrix**		
		Entrepreneurial Orientation	**Technological Capability**	**Firm Innovativeness**
Entrepreneurial Orientation	0.659	**0.659**		
Technological Capability	0.513	0.513	**0.513**	
Firm Innovativeness	0.498	0.119	0.049	**0.498**

Source: Field Data, 2019

From Table 4.35, it can be seen that the AVE for entrepreneurial orientation, technological capability and firm innovativeness were 0.659, 0.513 and 0.498 respectively. This implied that that the AVE for entrepreneurial orientation and technological capability was above the recommended threshold of 0.5 and therefore acceptable (Hair et al., 2017). In line with the logic recommended by (Borsboom, Mellenbergh, & Heerden, 2005), AVE for firm innovativeness marginally fell below the recommended threshold of 0.5 and was considered as minor and acceptable thereby conferring convergent validity of the model.

Table 4.35 also showed the discriminant validity matrix. Low correlations also provided evidence of discriminant validity. Entrepreneurial orientation, technological capability and firm innovativeness had AVE values that were larger than the squared correlations of the other constructs in the model. In the case of technological capability, AVE value was equal to its squared correlation. Uni-dimensionality was met by deletion of the statements with low loadings to the satisfaction of the corrected base model and further confirmation of *a priori* theory. The item reliabilities shown in Table 4.34 further confirmed that the models were unidimensional.

4.4.2.2 Structural Model

After the confirmatory acceptance of the measurement model, the study next modelled the structural equations. The study adopted the segmentation approach (Rungtusanatham, Miller, & Boyer, 2014) to analyse the relationships as two distinct pathways. The various pathways are shown in Figure 4.9.

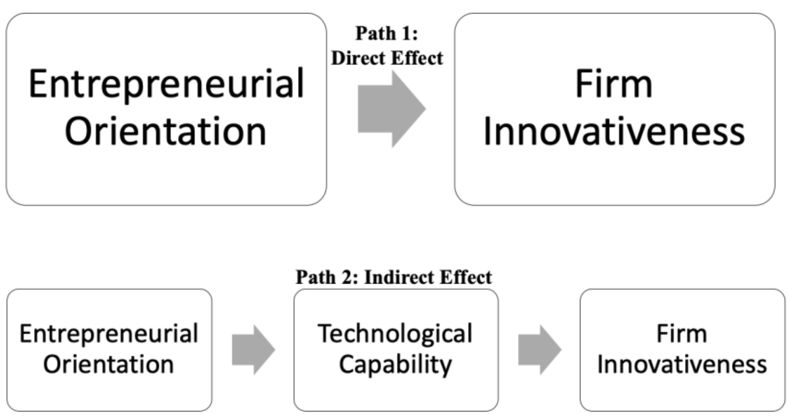

Figure 4.9: Alternative Effects Schema

As observed in Figure 4.9, in the first diagram was a direct path between entrepreneurial orientation and firm innovativeness. The second diagram was made of two relationships, whereby the connecting path between entrepreneurial orientation passed through an intermediary of technological capability, thus the mediating factor. Thereafter, the following hypothesis that were indicative of the paths were defined for testing; -

H_0: *Technological capability does not mediate the relationship between entrepreneurial orientation and firm innovativeness in manufacturing SMEs.*

H_{2a}: *Entrepreneurial orientation significantly directly affects firm innovativeness in manufacturing SMEs.*

H_{2b}: *Entrepreneurial orientation significantly affects technological capability in manufacturing SMEs.*

H_{2c}: *Technological capability significantly affects firm innovativeness in manufacturing SMEs.*

H_{2d}: *Technological capability mediates the relationship between entrepreneurial orientation and firm innovativeness in manufacturing SMEs.*

To assess the relationship between entrepreneurial orientation and firm innovativeness, regression weights for the pathway were analysed. The parameter estimates are presented in Table 4.36.

Table 4.36: Estimates of Direct Effects Pathway between Entrepreneurial Orientation and Firm Innovativeness

Parameter	Unstandardised	Standardised	S.E.	C.R.	P
Measurement Model					
EOA3 <--- Entrepreneurial orientation	1	0.527			
EOA8 <--- Entrepreneurial orientation	0.959	0.521	0.162	5.929	***
EOP3 <--- Entrepreneurial orientation	0.982	0.537	0.172	5.724	***
EOP5 <--- Entrepreneurial orientation	1.05	0.546	0.181	5.789	***
EOP7 <--- Entrepreneurial orientation	0.993	0.467	0.194	5.107	***
EORT2 <--- Entrepreneurial orientation	1.101	0.539	0.196	5.614	***
EORT4 <--- Entrepreneurial orientation	0.906	0.535	0.163	5.573	***
EORT6 <--- Entrepreneurial orientation	1.108	0.595	0.185	5.972	***
EOCA1 <--- Entrepreneurial orientation	1.272	0.649	0.199	6.382	***
FI3 <--- Firm Innovativeness	1	1.044			
FI1 <--- Firm Innovativeness	0.432	0.43	0.425	1.018	0.309
Entrepreneurial Orientation Disturbance	0.31		0.082	3.769	***
Firm Innovativeness Disturbance	0.722		0.729	0.99	0.322
Error on EOA3	0.808		0.085	9.489	***
Error on EOA8	0.767		0.08	9.527	***
Error on EOP3	0.737		0.078	9.468	***
Error on EOP5	0.808		0.086	9.448	***
Error on EOP7	1.099		0.114	9.65	***
Error on EORT2	0.919		0.1	9.234	***
Error on EORT4	0.636		0.069	9.227	***
Error on EORT6	0.695		0.079	8.777	***
Error on EORT6	0.689		0.081	8.486	***
Error on FI3	-0.062		0.726	-0.085	0.932
Error on FI1	0.619		0.152	4.068	***
Structural Model					
Firm Innovativeness <--- Entrepreneurial Orientation	0.296	0.191	0.123	2.415	0.016

Note: χ^2 *(37) = 66.866, p < 0.05, CFI = 0.938, ILI = 0.941, RMSEA = 0.058,* R^2 *= 0.036*

Source: Field Data, 2019

As presented in Table 4.36, the relationship between latent endogenous variable, firm innovativeness and its measurement observed variable FI1 was statistically insignificant at 95% confidence interval (*p = .309)*. Additionally, the disturbance on firm innovativeness was statistically insignificant *(p = 0.322)*. The covariance on FI1 was also statistically insignificant (p= 0.932). All other latent variable estimates were statistically significant. Furthermore, the firm innovativeness disturbance and the error estimates on statement FI1 were also statistically insignificant. It can also be interpreted that a 1-unit change of the latent variable entrepreneurial orientation, caused a change of 0.767 units in the variable measured by EOA8. Furthermore, this observed variable had a standard error of 0.08.

The critical ratio for the regression weight (C.R.) equivalent to the number of times that the standard error times for EOA8 is estimated to be above zero is 9.527. Furthermore, it is estimated that the entrepreneurial orientation explained 3.6 percent of its firm innovativeness. The error variance of firm innovativeness accounted for approximately 96.4 percent of the error. The study further assessed the covariances and correlations amongst the error variable estimates. The estimates of the covariances and the correlations of the error measurements are presented in Table 4.37.

Table 4.37: Covariance and Correlations of Direct Effects Pathway between Entrepreneurial Orientation and Firm Innovativeness

	Correlation	Covariance Estimate			
Errors	**Estimate**	**Estimate**	**S.E**	**C.R**	**p**
EOA3 <--> EOA8	0.072	0.057	0.06	0.946	0.344
EOP3 <--> EOP7	0.077	0.07	0.065	1.079	0.281
EOP5 <--> EOP7	0.254	0.239	0.073	3.26	0.001
EORT2 <--> EORT4	0.093	0.071	0.06	1.176	0.24
EORT2 <--> EORT6	0.083	0.066	0.065	1.026	0.305
EORT4 <--> EORT6	0.197	0.131	0.055	2.375	0.018

Source: Field Data, 2019

From the findings in Table 4.37, error variances on Statements EOP5 and EOP7 had a correlation of 0.254, covariance of 0.239 and was statistically significant *(C.R. = 3.26, p <0.05)*. The error variances for the statement EORT4 and EORT6 was also statistically significant *(C.R. = 2.375, p < 0.05)*. All other estimates for the error variances in the model were statistically insignificant.

A review of the structural model indicated that it had a p-value of 0.016 and was therefore adjudged to be statistically significant at 95% confidence interval. *The study therefore did not reject the hypothesis, H_{2a} that there was a direct relationship between entrepreneurial orientation and firm innovativeness.*

The parameter estimates of the second path between technological capability and entrepreneurial orientation are presented in Table 4.38.

Table 4.38: Estimates for the Pathway between Entrepreneurial Orientation and Technological Capability

Parameters	Unstandardised	Standardised	S.E.	C.R.	P
Measurement Model					
EOA3 <--- Entrepreneurial orientation	1	0.511			
EOA8 <--- Entrepreneurial orientation	0.947	0.499	0.158	5.986	***
EOP3 <--- Entrepreneurial orientation	0.973	0.517	0.169	5.772	***
EOP5 <--- Entrepreneurial orientation	1.066	0.537	0.18	5.928	***
EOP7 <--- Entrepreneurial orientation	1.105	0.504	0.197	5.614	***
EORT2 <--- Entrepreneurial orientation	1.175	0.558	0.196	6.008	***
EORT4 <--- Entrepreneurial orientation	0.987	0.566	0.163	6.046	***
EORT6 <--- Entrepreneurial orientation	1.15	0.599	0.183	6.274	***
EOCA1 <--- Entrepreneurial orientation	1.306	0.647	0.198	6.61	***
TCPOP9 <--- Technological Capability	1	0.745			
TCPOP2 <--- Technological Capability	1.021	0.651	0.12	8.511	***
Entrepreneurial orientation Disturbance	0.292		0.077	3.811	***
Technological Capability disturbance	0.077		0.056	1.382	0.167
Error on EOA3	0.826		0.083	9.979	***
Error on EOA8	0.79		0.079	10.029	***
Error on EOP3	0.759		0.076	9.932	***
Error on EOP5	0.818		0.083	9.875	***
Error on EOP7	1.05		0.107	9.824	***
Error on EORT2	0.892		0.093	9.609	***
Error on EORT4	0.606		0.064	9.526	***
Error on EORT6	0.69		0.074	9.348	***
Error on EOCA1	0.692		0.075	9.169	***
Error on TCPOP9	0.432		0.066	6.497	***
Error on TCPOP2	0.765		0.089	8.582	***
Structural Model					
Technological Capability <--- Entrepreneurial orientation	1.258	0.926	0.187	6.719	***

Note: χ^2 *(56) = 99.667, $p < 0.05$, CFI = 0.935, ILI = 0.938, RMSEA = 0.057, R^2 = 0.513*

Source: Field Data, 2019

As presented in Table 4.38, the disturbance on technological capability *(CR = 1.382, p = 0.167*) was statistically insignificant. All other estimates were statistically significant. It can also be interpreted that a 1-unit change of the latent variable entrepreneurial orientation, affects a change of 0.973 units in the variable measured by EOP3. Furthermore, this observed variable had a standard error of 0.169. The critical ratio for regression weight (CR) equivalent to the number of times that the standard error times is estimated to be above zero is 5.772. Furthermore, it is estimated that the entrepreneurial orientation explained 51.3 percent of its technological capability. The error variance of technological capability accounted for approximately 48.7 percent of the error.

The structural model *(CR = 6.719,* $p < 0.05$*)* was therefore judged to be statistically significant at 95% confidence interval. *The study therefore did not reject the hypothesis,* H_{2b} *that there was a relationship between technological capability and entrepreneurial orientation.*

The study also reviewed the relationship in the pathway between technological capability and firm innovativeness. The parameter estimates of the first path between technological capability and firm innovativeness are presented in Table 4.39.

Table 4.39: Estimates for the Pathway between Technological Capability and Firm Innovativeness

Parameters	Unstandardised	Standardised	S.E.	C.R.	P
Measurement Model					
FI3 <--- Firm Innovativeness	1	0.394			
FI1 <--- Firm Innovativeness	3.014	1.131	2.8	1.077	0.282
TCPOP9 <--- Technological Capability	1	0.745			
TCPOP2 <--- Technological Capability	1.021	0.651	0.12	8.511	***
Technological Capability Disturbance	0.077		0.056	1.382	0.167
Firm Innovativeness Disturbance	0.092		0.078	1.175	0.24
Error on FIV1_3	0.58		0.113	5.111	***
Error on FIV1_1	-0.212		0.884	-0.24	0.811
Error on TCPOP9	0.432		0.066	6.497	***
Error on TCPOP2	0.765		0.089	8.582	***
Structural Model					
Firm Innovativeness <--- Technological Capability	0.433	0.975	0.527	0.823	0.411

Note: χ^2 *(56) = 99.667, p < 0.05, CFI = 0.935, ILI = 0.938, RMSEA = 0.057,* R^2 *= 0.049*

Source: Field Data, 2019

As presented in Table 4.39, the relationship between firm innovativeness and statement FI1 *(CR = 1.077, p > 0.05)* was statistically insignificant. In addition to this, the error variable on FI1 *(C.R. = -0.24, p > 0.05)*, and the disturbances on firm innovativeness and technological capability were also statistically insignificant. All other estimates were statistically significant. It can also be interpreted that a 1-unit change of the latent variable technological capability, affects a change of 1.021 units in the variable measured by TCPOP2. Furthermore, this observed variable had a standard error of 0.12. The critical ratio for regression weight (C.R.) equivalent to the number of times that the standard error times is estimated to be above zero for the relationship between TCPOP9 and technological capability is 8.511. Furthermore, it is estimated that the entrepreneurial orientation explained 4.9 percent of the firm innovativeness. The error variance of firm innovativeness accounted for approximately 95.1 percent of the error.

The structural model had a p-value of 0.411 and it was therefore adjudged to be statistically insignificant at 95% confidence interval. *The study therefore rejected the hypothesis H_{2c} that there was a relationship between technological capability and firm innovativeness.*

The study next reviewed the influence of entrepreneurial orientation on firm innovativeness with a technological capability as a mediator as an indirect effect. The findings are presented in Table 4.40.

Table 4.40: Estimates on Indirect Effects Pathway between Entrepreneurial Orientation and Firm Innovativeness after mediation

Parameters	Unstandardised	Standardised	S.E.	C.R.	P
Measurement Model					
EOA3 <--- Entrepreneurial orientation	1	0.511			
EOA8 <--- Entrepreneurial orientation	0.947	0.499	0.158	5.986	***
EOP3 <--- Entrepreneurial orientation	0.973	0.517	0.169	5.772	***
EOP5 <--- Entrepreneurial orientation	1.066	0.537	0.18	5.928	***
EOP7 <--- Entrepreneurial orientation	1.105	0.504	0.197	5.614	***
EORT2 <--- Entrepreneurial orientation	1.175	0.558	0.196	6.008	***
EORT4 <--- Entrepreneurial orientation	0.987	0.566	0.163	6.046	***
EORT6 <--- Entrepreneurial orientation	1.15	0.599	0.183	6.274	***
EOCA1 <--- Entrepreneurial orientation	1.306	0.647	0.198	6.61	***
FI3 <--- Firm Innovativeness	1	0.394			
FI1 <--- Firm Innovativeness	3.014	1.131	2.8	1.077	0.282
Entrepreneurial Orientation Disturbance	0.292		0.077	3.811	***
Firm Innovativeness Disturbance	0.092		0.078	1.175	0.24
Error on EOA3	0.826		0.083	9.979	***
Error on EOA8	0.79		0.079	10.029	***
Error on EOP3	0.759		0.076	9.932	***
Error on EOP5	0.818		0.083	9.875	***
Error on EOP7	1.05		0.107	9.824	***
Error on EORT2	0.892		0.093	9.609	***
Error on EORT4	0.606		0.064	9.526	***
Error on EORT6	0.69		0.074	9.348	***
Error on EOCA1	0.692		0.075	9.169	***
Error on FI3	0.58		0.113	5.111	***
Error on FI1	-0.212		0.884	-0.24	0.811
Structural Model					
Firm Innovativeness <--- Entrepreneurial orientation	-0.501	-0.83	0.646	-0.777	0.437

Note: χ^2 *(56) = 99.667, p < 0.05, CFI = 0.935, ILI = 0.938, RMSEA = 0.057,* R^2 *= 0.119*

Source: Field Data, 2019

As presented in Table 4.40, the relationship between latent endogenous variable, firm innovativeness and its measurement observed variable FI1 was statistically insignificant at 95% confidence interval (*p = .282)*. The disturbance on firm innovativeness was also statistically insignificant *(p = 0.24)*. All other latent variable estimates were statistically significant. Furthermore, the firm innovativeness disturbance and the error estimates on statement FI1 were also statistically insignificant. It can also be interpreted that a 1-unit change of the latent variable entrepreneurial orientation, caused a change of 0.947 units in the variable measured by EOA8. Furthermore, this observed variable had a standard error of 0.158.

The critical ratio for the regression weight (C.R.) equivalent to the number of times that the standard error times for EOA8 is estimated to be above zero is 5.986. Furthermore, it is estimated that the entrepreneurial orientation explained 11.9 percent of its firm innovativeness. The error variance of firm innovativeness accounted for approximately 88.1 percent of the error. The study further assessed the covariances and correlations amongst the error variable estimates. The estimates of the covariances and the correlations of the error measurements are presented in Table 4.41.

Table 4.41: Covariance and Correlations of the Indirect Effects Pathway between Entrepreneurial Orientation and Firm Innovativeness

Errors in	**Correlation Estimate**	**Covariance**			
		Estimate	**S.E.**	**C.R.**	**p**
EOA3 <--> EOA8	0.096	0.077	0.058	1.331	0.183
EOP3 <--> EOP7	0.061	0.055	0.062	0.88	0.379
EOP5 <--> EOP7	0.238	0.221	0.07	3.174	0.002
EORT2 <--> EORT4	0.057	0.042	0.055	0.752	0.452
EORT2 <--> EORT6	0.064	0.05	0.06	0.846	0.398
EORT4 <--> EORT6	0.172	0.111	0.05	2.201	0.028

Source: Field Data, 2019

From the findings in Table 4.41, error variances on Statements EOP5 and EOP7 had a correlation of 0.238, covariance of 0.221 and was statistically significant *(C.R. = 3.174, p <0.05)*. The error variances for the statement EORT4 and EORT6 was also statistically significant *(C.R. = 2.201, p < 0.05)*. All other estimates for the error variances in the model were statistically insignificant. A review of the structural model indicated that it had a p-value of 0.437 and was therefore adjudged to be statistically insignificant at 95% confidence interval.

To make an overall judgment on the study hypothesis, the various structural models were analysed in view of the various effects as indicated in Figure 4.9. Their overall findings are presented in Table 4.42.

Table 4.42: Comparison of Alternative Paths

Path	Associated Hypothesis	Beta Estimate	S.E	Critical Ratio (C.R.)	p-value (5% Significance)	Comment
Path 1: Entrepreneurial Orientation – Firm Innovativeness	H_{2a}	0.296	0.123	2.415	0.016	Significant and direct effect not rejected.
Path 2A: Entrepreneurial Orientation - Technological Capability	H_{2b}	0.433	0.527	6.719	0.000	Significant and direct effect not rejected.
Path 2B: Technological Capability – Firm Innovativeness	H_{2c}	1.258	0.187	0.823	0.411	Statistically insignificant
Path 2C: Technological Capability added as a mediator affects relationship between Entrepreneurial Orientation and Firm Innovativeness	H_{2d}	-0.501	0.646	-0.777	0.437	Reduction in beta coefficient and statistically insignificant

According to the findings in Table 4.42, the relationship through Path 1 was statistically insignificant. The same findings also show that the relationship in Path 2A was similarly statistically insignificant. Even though the relationship in Path 2B was statistically significant, the pathway was incomplete thus leading to the rejection of the overall hypothesis that there is a statistically significant relationship. This study aligned to the discourse by scholars such as that discouraged the distinction between partial or complete mediation (Rucker, Preacher, Tormala, & Petty, 2011; Hayes and Rockwood, 2017). In the findings for Path 2C, the coefficient reduced from 0.296 to -0.501 as TC M enters the model. In addition to this, the model became non- significant, thereby suggesting mediation. However, the relationship between TC and FI was found to be statistically insignificant. This led to the inference that there was no mediating relationship with technological capability as a variable.

The study therefore, rejected the overall hypothesis that Technological Capability intervened the relationship between Entrepreneurial Orientation and Firm Innovativeness in Manufacturing SMEs.

4.4.3 Entrepreneurial Orientation, Environmental Dynamism and Firm Innovativeness

As a result of the third objective, the study also sought to determine whether there was a moderating influence of environmental dynamism on the relationship between entrepreneurial orientation and firm innovativeness on manufacturing SMEs in Nairobi. These were hypothesised as follows; -

H_0: *Environmental Dynamism does not moderate the relationship between Entrepreneurial Orientation and Firm Innovativeness in Manufacturing SMEs.*

H_3: *Environmental Dynamism moderates the relationship between Entrepreneurial Orientation and Firm Innovativeness in Manufacturing SMEs.*

The variables were modelled into a hierarchical regression equation. This involved a systematic addition of additional variables into the model until the desired model was obtained. Three models were developed. The first had the constant and a composite score for Entrepreneurial Orientation as the predicators. The second had a constant, a composite score for entrepreneurial orientation, and environmental dynamism as the predicators. The third had all the variables, namely the constant, the composite score for entrepreneurial orientation, environmental dynamism, combined entrepreneurial orientation and environmental dynamism as predictors. The third model was selected as the final model on the basis of improved coefficients. A summary of these models is presented in Table 4.43.

Table 4.43: Effect of Environmental Dynamism on the Relationship Between Entrepreneurial Orientation and Firm Innovativeness

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.345[a]	0.119	0.114	0.64166
2	.358[b]	0.128	0.118	0.6401
3	.373[c]	0.139	0.125	0.63768

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	10.056	1	10.056	24.423	.000[b]
	Residual	74.522	181	0.412		
	Total	84.577	182			
2	Regression	10.827	2	5.413	13.212	.000[c]
	Residual	73.751	180	0.41		
	Total	84.577	182			
3	Regression	11.789	3	3.93	9.664	.000[d]
	Residual	72.788	179	0.407		
	Total	84.577	182			

Notes: MODEL SUMMARY a. Predictors: (Constant), Composite score for Entrepreneurial Orientation; b. Predictors: (Constant), Composite score for Entrepreneurial Orientation, Environmental Dynamism; c. Predictors: (Constant), Composite score for Entrepreneurial Orientation, Environmental Dynamism, Entrepreneurial Orientation and Environmental Dynamism. ANOVA a. Dependent Variable: Firm Innovativeness; b. Predictors: (Constant), Composite score for Entrepreneurial Orientation; c. Predictors: (Constant), Composite score for Entrepreneurial Orientation, Environmental Dynamism; d. Predictors: (Constant), Composite score for Entrepreneurial Orientation, Environmental Dynamism, Entrepreneurial Orientation and Environmental Dynamism

Source: Field Data, 2019

The findings in Table 4.43 show that the third model has a coefficient of variation of *R*= 0.373 which indicated a moderate relationship and was acceptable according to Pallant (2005). The coefficient of determination (R^2) = 0.139. The adjusted coefficient of determination, Ra^2 = 0.125 indicated an over fitting of the model. This further indicated that 12.5% of the dependent variables were explained by the independent variables. A previous research Perez-Luno et al., (2010) similarly used low values of coefficients of determination.

To model the regression equation, the coefficients of the hierarchical regression model were extracted and are presented in Table 4.44.

Table 4.44: Coefficients for Effect of Environmental Dynamism on Effect of Entrepreneurial Orientation on Firm Innovativeness

		Coefficients[a]				
Model		**Unstandardised**		**Standardised**	**t**	**Sig.**
		B	**Std. Error**	**Beta**		
1	(Constant)	1.996	.384		5.194	.000
	Composite score for Entrepreneurial Orientation	.581	.118	.345	4.942	.000
2	(Constant)	1.782	.414		4.307	.000
	Composite score for Entrepreneurial Orientation	.457	.148	.271	3.090	.002
	Environmental Dynamism	.212	.154	.120	1.372	.172
3	(Constant)	5.488	2.444		2.245	.026
	Composite score for Entrepreneurial Orientation	-.645	.732	-.383	-.882	.379
	Environmental Dynamism	-1.013	.811	-.576	-1.249	.213
	Entrepreneurial Orientation and Environmental Dynamism	.360	.234	1.217	1.538	.126

a. Dependent Variable: Firm Innovativeness

Source: Field Data, 2019

As presented in Table 4.44, a combination of entrepreneurial orientation and environmental dynamism has the highest impact on firm innovativeness. Essentially, a unit change in the combined proportions of environmental dynamism and entrepreneurial orientation triggered a 121.7% change in firm innovativeness. In addition to this, the coefficients of entrepreneurial orientation and environmental dynamism were negative indicating an inverse relationship between these individual variables and firm innovativeness in the composite model.

The findings suggested that the effect of environmental dynamism by itself on the relationship between entrepreneurial orientation and firm innovativeness is not statistically significant. In addition to this, the influence of the individual variables - entrepreneurial orientation, environmental dynamism and combined environmental dynamism and entrepreneurial orientation were also not statistically significant as their individual *p*-values are 0.379, 0.213, and 0.126, respectively, were above 0.05. However, the composite overall model in the relationship had a *p*-value of less than 0.05, thereby being adjudged to be statistically significant. The findings suggest that the variables only correlate when interacting but not individually by themselves. The inclusion of the three afore-mentioned variables into the regression model has been confirmed as acceptable by other scholars (Wasserstein & Lazar, 2016; Greenland, et al., 2016; Gagnier, 2017; Heinze & Dunkler, 2017).

The hierarchical regression model obtained is indicated below; -

$$Y_3 = 5.488 - 0.645X - 1.013X_7 + 0.360X.X_7$$

Where Y_3 = Firm Innovativeness; X= Composite score for Entrepreneurial Orientation; X_7 = Composite Score for Environmental Dynamism.

Reviewing the analysis of the variance of the overall model showed that, F (3,182) = 9.664, $p < 0.05$. which was greater than $F_{Critical}$ (3,182) = 2.6542, $p < 0.05$ and therefore the study concluded that overall model was still statistically significant. *The study therefore, failed to reject the hypothesis that Environmental Dynamism moderates the relationship between Entrepreneurial Orientation and Firm Innovativeness in Manufacturing SMEs.*

4.4.4 Entrepreneurial Orientation, Technological Capability, Environmental Dynamism and Firm Innovativeness

As a sequel to the fourth objective, the study also sought to establish the joint effect of entrepreneurial orientation, technological capability, environmental dynamism on firm innovativeness in manufacturing SMEs in Nairobi. The postulated hypothesis was as follows; -

H_0: *Entrepreneurial orientation, technological capability, environmental dynamism do not have a joint effect on firm innovativeness in manufacturing SMEs*

H_4: *Entrepreneurial orientation, technological capability, environmental dynamism have a Significant joint effect on firm innovativeness in manufacturing SMEs.*

A multiple regression model was used to test the joint effect between entrepreneurial orientation, technological capability and environmental dynamism. In the first instance EO was modelled against FI. Subsequently, TC as an additional variable and thereafter ED was added. The final model summary is presented in Table 4.45.

Table 4.45: Joint Effect of Entrepreneurial Orientation, Technological Capability and Environmental Dynamism of Firm Innovativeness

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.366[a]	.134	.119	.63971

ANOVA[a]						
Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	11.327	3	3.776	9.226	.000[b]
	Residual	73.251	179	.409		
	Total	84.577	182			

Notes: MODEL SUMMARY a. Predictors: (Constant), Environmental Dynamism, Composite score for Entrepreneurial Orientation, Technological Capability; ANOVA a. Dependent Variable: Firm Innovativeness, b. Predictors: (Constant), Environmental Dynamism, Composite score for Entrepreneurial Orientation, Technological Capability

Source: Field Data, 2019

The findings in Table 4.45 show that there is a moderate relationship model with R= 0.366. According to Pallant, 2005, this level of correlation is acceptable. Whereas, the coefficient of determination was computed to be $R^2 = 0.134$, the adjusted coefficient ($Ra^2 = 0.119$) indicated an over-fitting of the previous model thereby leading to the adjustment. Accordingly, it was inferred that 11.9% of the firm innovativeness were explained by the independent variables. Furthermore, given that F (3,182) = 9.226, $p < 0.05$ was greater than $F_{Critical}$ (3,182) = 2.6542, $p < 0.05$ it was concluded that overall model was statistically significant. The modelling of the regression equation yielded the coefficients as presented in Table 4.46.

Table 4.46: Coefficients for Regression Equation on Joint Effect of Entrepreneurial Orientation, Technological Capability and Environmental Dynamism on Firm Innovativeness

Model		Unstandardised Coefficients B	Unstandardised Coefficients Std. Error	Standardised Coefficients Beta	t	Sig.
1	(Constant)	1.743	.415		4.200	.000
	Composite score for Entrepreneurial Orientation	.543	.167	.322	3.251	.001
	Technological Capability	-.163	.147	-.120	-1.105	.271
	Environmental Dynamism	.303	.175	.172	1.732	.085

Coefficients[a]

Notes a. Dependent Variable: Firm Innovativeness

Source: Field Data, 2019

From the findings in Table 4.46, the coefficients suggested that entrepreneurial orientation had the highest positive impact on firm innovativeness. A unit change in entrepreneurial orientation caused a change of 0.322 units in firm innovativeness and this was found to be statistically significant. On the other hand, technological capability had a negative impact on firm innovativeness in this composite relationship. A unit change in technological capability will trigger a decline of 0.12 units in firm innovativeness. This finding is however, not statistically significant. A unit change in the environmental dynamism also affects 0.172 positive change in firm innovativeness although this finding is also statistically not significant.

In addition to the above hypothesis test, a correlation analysis was carried out on the between entrepreneurial orientation and technological capability and between technological capability and firm innovativeness. The findings are presented in Table 4.47.

Table 4.47: Pearson Correlation Analysis

	Entrepreneurial Orientation	Technological Capability	Firm Innovativeness
Entrepreneurial Orientation	1		
Technological Capability	.716*	1	
Firm Innovativeness	.345*	.221*	1

* Correlation is significant at the 0.05 level (2-tailed).

Source: Field Data

According to the findings in Table 4.47, there was a statistically significant relationship between technological capability and composite entrepreneurial orientation. There is also a statistically significant relationship between firm innovativeness and technological capability, although this relationship is weaker.

Ruiz-Ortega et al., 2013 established that there was a statistical significance on the joint relationship between environmental dynamism, technological capability and their effect on firm innovativeness. Technological capability greatly strengthened the relationship between environmental dynamism and entrepreneurial orientation (Ruiz-Ortega et al., 2013). The study infers that the joint effect of these variables certainly affected innovativeness. Individually technological capability did not have a statistically significant outcome as the *p*-value was greater than 0.05. However, the overall model was statistically significant. This implied that an interaction of all the variables led to an outcome that was statistically significant. In previous treatises, Wasserstein & Lazar, (2016), Greenland, et al., (2016), Gagnier (2017), Heinze & Dunkler (2017) confirmed as acceptable the retention of coefficients that were individually statistically insignificant (X_6 and X_7) in regression models that were overall statistically significant.

The multiple regression model was thus formulated as follows; -

$$Y_4 = 1.743 + 0.543X - 0.163X_6 + 0.303X_7$$

Where Y_4 = Firm Innovativeness; X = Entrepreneurial Orientation; X_6 = Technological Capability and X_7 = Environmental Dynamism.

The analysis of the variance of the model showed that overall model to be statistically significant and *the study therefore, failed to reject the hypothesis that entrepreneurial orientation, technological capability, environmental dynamism have a joint significant effect on firm innovativeness in manufacturing SMEs in Nairobi County, Kenya.*

4.5 Revised Conceptual Model of Study

After having studied and tested the various hypothesis, the study proposes a revised conceptual model that takes to account the new findings and interpretation. The revised conceptual model is shown in Figure 4.10.

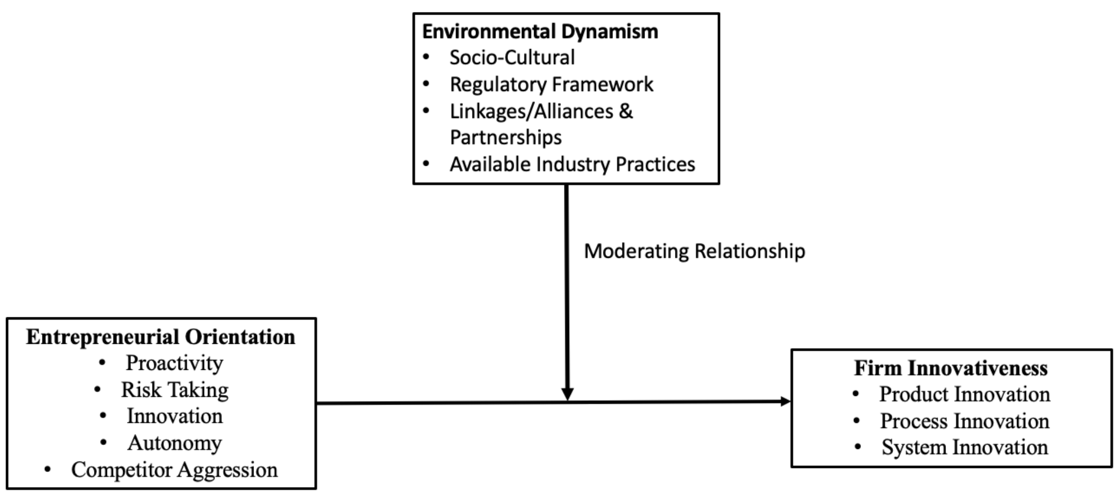

Figure 4.10: Revised Conceptual Model

As shown in Figure 4.10, entrepreneurial orientation was retained as an independent variable that directly affected firm innovativeness. In addition to this, environmental dynamism was also retained as a moderating variable that affected the relationship between entrepreneurial orientation and firm innovativeness. The effect of technological capability on the relationship between entrepreneurial orientation and firm innovativeness was however inconclusive. This suggested a need for further studies so as to be able to determine the exact relationship of the variable to firm innovativeness.

4.6 Chapter Summary

The chapter provided the quantitative findings of the field questionnaire survey. In this chapter, a descriptive analysis on the profiles of the surveyed firms was provided and then the chapter next explored the relationship between these profiles and firm innovativeness. Thereafter, insights into how the identified variables affected firm innovativeness were provided. These were studied through a series of descriptive analysis and subsequent interpretation of multi-item Likert scales.

Having presented the descriptive test findings of the study, the chapter next provided a discussion on the outcome of modelling of the variables into regression equations. In particular, the findings showed that some individual variables with the regression equations were statistically not significant. The findings also showed that all the four overall models were however, statistically significant, leading to the decision not to reject all the proposed alternate hypothesis. Finally, a revised conceptual model is presented in light of the findings of the study. A presentation of the qualitative findings is presented in the next chapter.

CHAPTER FIVE

PRESENTATION OF FINDINGS FROM CASE STUDIES

5.1 Introduction

Distinct from the previous chapter which provided the findings from the field questionnaire survey, this chapter presents the findings of the case studies. The approach at this stage was qualitative in nature unlike the previous chapter that was quantitatively designed. In line with the general study objective, the case research focused on how entrepreneurial orientation influenced innovativeness in individual cases. The study also sought to understand the influence of other variables on innovativeness.

The chapter begins by outlining the case design for the study. Subsequently, profiles of the cases studied are presented and analysed. Details of the case narratives are then presented followed by a thematic analysis of the narrations. A synthesis of the thematic analysis appears at the end of the chapter to provide a basis for further triangulation and possible corroboration.

5.2 Case Design

Case studies have previously been used extensively to understand complex issues in actual world situations in fields that include sociology, education, law, medicine and even information technology (Tellis, 1997; Leite & Marks, 2005; Yin, 2009; Harrison et al., 2017). Their main attraction is that they go beyond the quantitative statistical findings and are generally accepted as being able to provide a synergistic and holistic explanation of the social and behavioural phenomena (Leite & Marks, 2005; Zainal, 2007; Yin, 2009;

Harrison et al., 2017). Due to the broadness of the information sought and obtained, case studies offer a valuable approach in the development of theory (Blumberg et al., 2014). Similar corroboration has been used previously by other scholars (Gilbert, 2007; Kimeme & Mbwambo, 2009).

Unlike surveys, case studies focus on a limited number of individuals or geography as the subject of study (Zainal, 2007). Case studies incorporate the three basic principles of describing, understanding and explaining a phenomenon (Tellis, 1997; Harrison et al., 2017). The purpose of the case interviews was to obtain detailed information, describing innovativeness and the causes of innovativeness in firms. Subsequently, on the basis of the case respondents' understanding and without having to control the external behavioural aspects and yet relate them to the contemporary situation (Yin, 2009) to explain the observed phenomenon.

Some of the advantages of case studies, include an examination of the data within the context of its use, and therefore, the phenomenon observed will be within its natural environment (Zainal, 2007). Case studies are also flexible and allow for both qualitative and quantitative evaluation of the data with no specific limitation on minimum or maximum number of cases (Tellis, 1997; Zainal, 2007). Furthermore, information obtained from case studies helps to explain the data in actual environments as well as the complexities of the real-life situations that may not be captured through other forms of research designs (Zainal, 2007; Yin, 2009).

Case studies have been criticised as lacking research rigour (Zainal, 2007; Yin, 2009). The study addressed this concern by appropriate instrumentation and secondly, it was on the basis of *a-priori* research that was identified in the literature review. Case studies have also been criticised as not being able to provide a basis for scientific generalisation because they are based on very limited cases (Tellis, 1997; Zainal, 2007; Yin, 2009). This position has however, been countered by the argument that generalisations on cases are made on theory rather than populations (Yin, 2009). Moreover, a key objective of the study was to enhance the existing body of knowledge on innovativeness.

Finally, case studies have been criticised as being too onerous and with unnecessarily large amounts of documentation (Zainal, 2007; Yin, 2009). In spite all this, case studies allow a micro-level examination of the data by the scholar and the incorporation of the views of the respondents (Tellis, 1997; Yin, 2009). A quintessence of case studies is that they combine specificity of approach, intensity of investigations and a multiplicity of sources of evidence (Leite & Marks, 2005). In the social sciences, Gilbert (2007), Neely & Hii, (2012), and Prihadyanti (2013), amongst others, explored the reasons for innovativeness within SMEs in various countries.

To address the critique of lack of research rigour and other agnostic views on case studies, the study adopted the recommendations of Yin (2009), where consideration was made on the questions that were then linked to the propositions. The four basic principles recommended by Yin (2009) included incorporating evidence into the analysis; considering all rival interpretations of the analysis; highlighting the most significant aspects of the case study and finally, making use of the researcher's prior knowledge to further the analysis. The unit of analysis was adopted as individual case firms. Yin (2009) also recommended that prior to the research, a determination be made on the logic linking the findings as well the criteria for the interpretation of the findings. As a result of this, the case study research passed the several precepts of research rigour.

To address the construct validity, all key informants were allowed to study and review the raw case study report for accuracy and content validation. To ensure internal validity, the narrative analysis was challenged and all narratives were interrogated against rival explanations. Conversely, to address external validity a multi-case study as compared to a single case study was adopted, effectively addressing the rival logic. Case study protocols were defined and used so as to ensure the consistency and reliability of the instrument (Teegavarapu & Summers, 2008).

Consequently, the study adopted a Descriptive Instrumental Multiple Case Design Approach. Multiple case studies require more than one case. They provide a more interactive and broad-based view of the issues being examined (Harrison et al., 2017) rather than an idiosyncratic view of one case. An instrumental design in contrast to the intrinsic design, allowed the study to explain the behaviour of the variables across all multiple and beyond the individual cases (Leite & Marks, 2005). A descriptive case design allows the study to describe the behaviour of the variables in the context that they are examined and on the basis of the *a-priori* knowledge that was established during the literature review of the study (Yin, 2009). The sources of evidence were a combination of in-depth interviews and observations that were carried out during the study and any other material documentation that was offered by the respondent at the firm’s premises.

5.3 Profiles of Case Study Firms

In the study, the selection of the cases was on the basis of similar broad profiles yet intrinsically different in their processes and operations. By applying a replication rather than sampling logic (Blumberg et al., 2014), the study purposively selected one entrepreneur from each sub-sector identified in Table 3.1 to get a total of four cases. It is recommended that cases be purposively selected so as to derive as much information as possible (Gilbert, 2007; Yin 2009). All firms were formally registered and competitively sourced for their customers on the basis of their products. All the individual entrepreneurs were aged over 40 years, although the years of operation of business ranged from six years to over 40 years. All the four firms had been in existence for more than five years and this allowed the respondents to share their individual experiences over several annual cycles.

Cumulatively, all the entrepreneurs had more than 20 years of individual work experience. In spite of their age differences, the case studies revealed that a good number of the entrepreneurs get into their own businesses after having spent some time either as employees on the same line of business or in other pursuits. Two of the entrepreneurs had started off as employees in the same line of business. After a period of formal employment, they quit the employment and started their own business in the same industry. The third entrepreneur started off as an apprentice in the same line of business before becoming an entrepreneur, albeit in a junior partnership role. In this case, the entrepreneur was a third-generation entrepreneur of their family businesses. In one of the cases, the entrepreneur’s level of experience was not exactly the same as the years of operation of the firm because they started the business after gaining experience elsewhere. In this instance, the entrepreneur was in a completely different line of business as an employee and started off the business as the development of a hobby.

The general profiles of the entrepreneurs are summarised in Table 5.1. For the sake of confidentiality of the firms, the case studies are reported in a general manner, disguising their true identity and their general business locations.

Table 5.1: Case Firms' Entrepreneurs Profiles

Case Pseudo Name	Age of Firm Entrepreneurs	Gender of Firm Entrepreneurs	Sector of Industry	Number of Years Firm has been in Business	Highest Education Level of Entrepreneurs	Vocational/ Industrial Training of Entrepreneurs	Previous Work Experience of Entrepreneurs
Kappa	51 years	Male	Wearing Apparel	17 years	Primary	Technical Institute Certification	6 years employment history
Omega	57 years	Male	Fabricated Metal Products	20 years	Tertiary Education (Diploma)	Trade Test Certification	Over 10 years employment history
Delta	51 years	Male	Food Products	6 years	Tertiary Education (Diploma)	Qualifications in Different field	Over 24 years but in a different line of business
Gamma	44 years	Male	Furniture, Wood and products of Wood & Cork	40 years	Secondary	No Training	Started off as apprentice. Acquired over 23 years within the same firm

Source: Field Data, 2019

To overcome the common weakness of context in narration (Blumberg et al., 2014), all respondents were interviewed in their respective places of work and at a time that was convenient to them.

5.4 Case Narratives

In all instances, appointments were made with the entrepreneurs for a meeting in a location of the firm that avoided distractions. In all instances, the interviews lasted approximately one hour. Using interview guides (See Appendix II), semi-structured interviews were conducted with the owner at the firm's premises and their responses recorded. The interviews allowed the interviewer to gather data from the respondent as well as providing an opportunity to ask follow-up questions until a saturation point was reached (Teegavarapu & Summers, 2008). The respondents were advised on the objective of the research and assured of utmost confidentiality. Anonymity as a step in mitigating common method variance was recommended by previous scholars (Podsakoff et al., 2003). The respondent was also asked to share copies of some of their customer orders and product designs that had been availed to the markets. During the interviews, the interviewer was able to observe the level of activity in the firm and depth of discussions that the respondent had with their clients who happened to come to the premises.

Narrative Approach was used to categorise the information obtained from the case studies. This approach has recently gained currency in business studies (Rhodes & Brown, 2005; Gertsen & Soderberg, 2011). It allowed a holistic review of the answers, which involves sharing of experiences by the respondent over a period of time (Rhodes & Brown, 2005). This further allowed an in-depth interpretation of the responses (Blumberg et al., 2014).

There were two steps in the Narrative Inquiry. In the first step, the inquiry focused on the experiences of the respondent. It therefore, constructed the respondents' experience based on evidence provided. The narratives then traced a chronology of an individual's experiences (Gay, Mills, & Airasian, 2012). It has been argued that the same narratives may vary depending on the context in which they are given (Blumberg et al., 2014). To address this concern, the respondents were part of the narration and were actively involved in making decisions about the circumstantial interpretations of the events that were recalled. Re-storying as a tool was then used to reconstruct the narrative account to incorporate the context and place of the events. Finally, as a reflection of the collaborative approach the respondent read and confirmed the contents of the final narrative account (Gay et al., 2012). The Narrative Accounts are presented in Sections 5.5.1 to 5.5.2.

The second step of the inquiry may be characterised as either structural, thematic, or interactional analysis. The study adopted the thematic analysis which focused on the content rather than the expression of the narrative. The thematic approach has been criticised for losing the context of the narrative whenever multiple stories are analysed (Blumberg et al.,2014). The themes were subsequently analysed and used to corroborate theory and build on other knowledge areas. The Thematic Analysis is presented as Section 5.6.

5.5 Individual Cases Narrations

The following sections provide the detailed narrations by the respective cases. They were held at their premises and initially recorded as *verbatim*. Subsequently they were reconstructed and thereafter shared with the respondents for confirmation.

5.5.1 Kappa Case

Kappa was a partnership in textile manufacturing that operated from a market stall on the outskirts of Nairobi’s Central Business District. Kappa also had bigger premises, which served as their warehouse and allowed bulk production. Their main products were protective overalls and aprons and other protective clothing, which were made on order by their clients with a smaller fraction of their sales going to the retail market. Mr K, being the senior partner, was 51 years of age, and after having completed his primary level education, was sent by an uncle to a local technical training institute for a course in tailoring. After completing the course, he was employed for four years. He then decided to try out his hand in the business once he saw the opportunity for making money was enormous. He initially worked informally and after two years registered the firm. In starting the formal business, he was assisted by his partner – who provided the seed financial capital.

Mr. K further explained that; -

> *In spite of not being highly educated, I realised that I was being a conduit for earning money for other people…I realised that I interacted with all the customers… I knew what their needs were and was able to resolve their problems without relying on my bosses…it is then that I thought of starting my own business….*

Kappa employed 8 people on a full-time basis and hired others, mainly tailors on a need basis. The duties of the staff were segregated with two people focusing on initial stitching, four others on the final appearance of the product, and one person doing the administration work. The last one was the sales person. Their previous year's annual sales turnover was about Kes. 7.7. million. Their customers were found all over the country. A majority of their sales were made to customers' orders. Kappa havd a sales person who procured jobs and sales orders for the firm. This was a niche market and the nature of their product was such that the customers' line of business dictated what was to be made.

According to Mr K, there was very little scope for innovation as mostly, their customers were pretty clear on what they wanted. This included the textile fabric and colour. They procured their fabric from local wholesalers, who often imported the materials. Their approach however, was conservative as they feared failure. He remembered a time, when they received an order and slightly modified the materials to what they thought was suitable. The customers ended up rejecting the entire consignment as the order was supposed to be made correctly to the advised specifications. He was left to bear the loss.

Mr K explained; -

> *My type of business is obtained through confirmed orders and mostly after a tender process… I do not wish to deviate from what the customer has requested for, especially after I have shown them samples…I once tried that and the sample was rejected for not being compliant to the tender specifications….*

Their main focus on innovation was process-based so as to manage costs, as they had very little control over the other parameters. The firm's emphasis and focus were on durability of the materials used. Considering themselves as small players in the industry, Kappa did not make any attempt to influence the customer tastes, but were very sensitive to any possible design changes that may occurred. Mr K, had also not considered that Kappa could vertically integrate their product lines, thereby expanding on their available product offerings. Neither had he considered automating his processes at the warehouse to have more efficient production as he considered the technology to be expensive and yet he did not have a market that could readily absorb the scale of production. He had also not considered foreign markets, as he said that he was unfamiliar with the export business. GTO did not patent, nor register any of their products with KIPI as they did not consider it worthwhile. This was more so because, all their products were custom-made and upon interaction with customers.

The challenges that affected the business, included competition in the market that occasionally leads to rejected goods and very thin profit margins. They also occasionally faced delayed payments by customers who purchased on credit terms. Occasionally, they had to contend with unstable electricity power supply. They had not experienced any obstacles from the regulatory and licensing authorities. If they were to reconsider their model, they would invest capital in being able to directly import their raw materials at a cheaper price, thus widening their margins. Mr K however, did not regret starting the business as he had since paid off his partner's capital and was considering buying him out of the firm.

5.5.2 Omega Case

TEM was the Sole Proprietor of Omega, a metal welding and fabrication enterprise that was about 5 km from Nairobi's Central Business District and which was coded as Omega. He was 57 years old and he established the business in 1999, after having been employed for over 10 years. TEM had a Diploma and Government Trade Test Grade I Certification in Metal Fabrication. He joined the business after being inspired by his late uncle, who had a similar business in Uganda. At the time, his uncle was a metal fabricator and seemed to have lots of money. This to him, was an opportunity to earn a lot of money.

TEM explained; -

> *I used to see my uncle with a lot of money! I really admired him because he was fully independent and did not have to wait for month end to buy anything. He had a pickup vehicle and, in those days, owning a vehicle was a sign of wealth*

On a regular basis, he employed 5 full-time staff and casual employees as and when there was demand. The firm's previous year's annualised sales turnover was Kes. 1.2 million. He spent less than 1% on innovation over the previous year and this mainly went to benchmarking expenses or surfing information from the internet. He maintained a catalogue of previous and contemporary designs that he uses for promotion. He also continually identified cheaper sources of materials for use within his firm. The bulk of his inputs was raw iron whose source was limited. TEM typically relied on walk-in business and referrals from previous customers.

In terms of the operational process, upon the potential customer contacting TEM, they would then agree on the proposed design and the product. New innovations were firmed up at that stage. The firm's operations were such that there was limited involvement by the employees on the design and concurrence of the product. He appreciated the need to have well experienced employees to ease production. His preference was for employees who had a minimum basic level of education and were willing to learn on the job where their skills are wanting. He maintained a tight control on his staff being involved in decision-making and other pivotal responsibilities because of the risk of pilferage and internal fraud. Any innovations by his staff would have to obtain his approval before it could be implemented. The entry barriers to the business were also low and there was the risk of his staff starting similar business, thereby taking off with his customers. TEM argued that this was a deliberate strategy to protect his market.

There were very many players in the industry and no one stood out as the dominant player. On the other hand, firms regularly collapsed from this industry and many entrepreneurs were wary of their survival. TEM survived predominantly due to creativity that was demanded within the business.

TEM further advised that; -

> *Our nature of business is about creativity… Customers get attracted to you if you have new concepts and designs…. They will also consider good and durable quality at an affordable cost…. Moreover, there are a few customers for whom cost is not really an issue so long as the design is unique and durable.*

Over time, he had been able to form partnerships with many business associates who included members of this trade association as well as the local public industry officials. He was the secretary of the local chapter of his traders' association.

He identified some of his challenges towards innovation as inadequate capital, stiff competition, unethical business practices, as well backward integration by the bigger players in the industry. This backward integration was also affected by professionals like architects and quantity surveyors, who seemed to have registered briefcase firms that competed with the artisans. He remembered a time, when he was asked to bid for a job, and submitted his designs only for the job to be awarded to a firm that he believed belonged to the supervising engineer but made use of his designs! In addition to this, his challenges also included lack of physical infrastructure such as stable premises, stable power and access to product markets. He was also worried about the entry of contractors from India and China, who were often are well-capitalised and seemed to have access to superior designs. He however, acknowledged that there was no interference from the regular city county government officials.

TEM had never registered any of his products with KIPI, as he was not aware of its value or the process. He remembered a time he came up with a design for a customer, and after a while, one large player came and offered him employment on the basis of the design. He did not take up the offer, but the big player employed someone else and the firm went on to fabricate and sell the designs as their own! He had never seen the need to engage the technical tertiary institutions as he considered them as purely academic institutes with no possible value to add to his business.

5.5.3 Delta Case

After an illustrious career in the telecommunications sector, SOM resigned from his job as an engineer with a leading firm in 2013, to try his hand at running Delta, a bakery. He was looking for something more challenging. Born 51 years ago, he had worked up the hierarchy with his previous employer of 24 years, gradually rising through the ranks to become a registered engineer. This business was quite a peripheral shift from his professional training, but he explained that his motivation was to get as far away from his employment memories as he could. He had unpleasant memories of his employer and in his last days, often felt unsecure and elected to pursue other opportunities.

SOM was nostalgic; -

> *When I left my previous employer, I vowed that I would never work for anyone again!... I remembered the endless amounts of times I spent proposing numerous changes to our infrastructure only to be frustrated by my superiors… We lost so many opportunities as a result of this…*

He was the sole proprietor in the firm. His wife also worked there mainly focusing on sales and distribution. At the beginning, he did a basic course in baking, and the rest of his knowledge was learnt on the job. He opened the bakery at the back of his residential house, where he quickly assembled the basic tools that he required. The entry requirements at the time were low. On average, he employed a minimum of five people but he was able to increase the staff complement based on incoming orders. He preferred to operate with lean staff because he reckoned that the margins were very thin due to competition from the bigger players. His average annual turnover was Kes.2.4 million. His target market was the low-income areas of eastern Nairobi, who preferred a quality product but were price sensitive. Due to the perishable nature of his products, his market coverage was very small. SOM once tried to bake cakes and specialised confectionaries, but realised that they were not as fast moving as bread and, therefore, he discontinued the new line.

SOM explained that; -

> *Bread is a staple food for most families in the city…can you imagine of a (the) day when there was no bread in your kitchen? … Due to its perishable nature, it has to be baked, bought and consumed almost every day as its shelf life is very limited*

The bread industry was to some extent regulated in so far as the size of the products was concerned. There was limited scope for innovation in products as there were many players. This left SOM with no option, but creativity in his processes and sources of raw materials. He spent a lot of effort and time in identifying sources of raw materials such as baking flour and other ingredients that offered better returns. He acknowledged that whereas creativity was important, it ultimately only had an impact if one could control the market. There were very many players in the baking industry. Apart from appraising himself on regulatory requirements, he did not spend any money on innovation.

SOM further explained that; -

> *I once tried baking and distributing cakes.... I was left with so much stock, which later got spoilt… I realised that my customers only take cakes for occasions and at that stage, I could not predict the volumes required…. I went back to what I understood best!*

Occasionally, SOM dealt with local licensing authorities who were interested in the public health requirements and always found his firm at fault – although he thought that this was more of a rent-seeking opportunity. Some of the challenges faced by the firm included unstable, yet expensive power and water supply as well as unreliable transport system that affected the distribution of his product. He had not registered any marks with KIPI because, in his opinion, his product was pretty standard and what his customers were interested in was hygiene and delivery at the cheapest price. His biggest regret in life was not having adequate capital, which he would effectively have used to deliver more products and carve a niche market for himself.

SOM concluded that; -

> *I have a very unique product, which is normally fresh at delivery …. I have managed to figure out the best combination of ingredients to ensure that the taste is good whilst keeping the quality at a desired level of the customer… all my production get finished by the wholesalers (customers) at delivery…*

5.5.4 Gamma Case

PZ was the Senior Partner with Gamma, which was a group of people who were originally from Central Africa but settled in Kenya in the 1970s. The firm's focus was on furniture and it operated from rented premises, about 10km from Nairobi's city centre. They registered the firm in 1979 and since then have been passing it on to subsequent generations. At 44 years of age, he joined his older siblings in the business after completing his secondary school education in 1996. He learnt the trade as an on-the-job-apprentice and has never had any formal training. The firm had up to 30 workers who were mainly family members and close relatives. Within the firm, the induction was by apprenticeship.

PZ narrated that; -

> *We are immigrants and we do not have any agricultural farms in Kenya. We do not intend to go back to our original land and therefore, our survival is based on doing well …. I did not do very well in school and therefore had no option but to join the family business…. All our younger relatives join the business as soon as they complete school…. We have to deal with prejudices of people not trusting us because they see us as foreigners and therefore, this acts as a motivation for us to do a really good job in terms of quality and costing.*

The firm was able to hand over the mantle of the business and its leadership to successive family members. The motivation for starting the business was for their survival in a foreign land. Subsequently, the motivation for innovation was driven by the need to remain relevant. Gamma had previously tried to attract partnerships but had failed, as potential investors always viewed the them suspiciously. They feel that the main reason for this was their ancestry, which had prejudiced them against the locals.

PZ said that their customers were very demanding and often alert to new designs and ways of doing things. There were many competitors and without innovation and unique designs, the firm could be easily sent out of business. Their source of innovation was not only from innate experience amongst the staff, but also from the internet, previous modified orders and also customer tastes. The source of the capital was from the partners' own sources.

There were numerous other challenges ranging from inadequate capital, competition; sensitive and fussy clients, to the high cost of renting premises, inadequate physical infrastructure such as markets, access roads to their workshops as well occasional harassment by the county government officials during their routine checks. Gamma had not registered any trademarks or patents with KIPI as they did not know how to go about it, neither did they know the value of doing so.

PZ concluded that; -

> *I do not wish to expand my business beyond the borders as I do not have adequate capital… In so far as what I presently do allows me to earn a decent living, why would I want to formally register my designs… There is enough business to all who want to do genuine business …we will compete at the artistry level….*

If they were to redo their business altogether, they would focus on identifying better sources of capital, as this is what held back their market expansion.

5.6 Thematic Analysis of the Case Narrations

From these case studies, the narratives deemed to affect innovativeness in the respective firms were noted and broadly categorised. A summary of the cross-firm narratives, analysed and amalgamated into the broad themes, is provided in Table 5.2.

Table 5.2: Analysis of Cross-Firm Narratives on Reasons for Firm Innovativeness

	Firm Narrative			
	Kappa	**Omega**	**Delta**	**Gamma**
Entrepreneurial Orientation	Need to be Own Boss Financial Prudence Cautious about losses from new ideas Senior management guidance	Need to be Own Boss Financial Prudence Passion Senior management guidance Newness of ideas is key to success	Need to Achieve Need to be Own Boss Financial Prudence Passion Senior Management Guidance	Need for Affiliation Financial Prudence All individuals in firm decide on available options Newness of ideas is key to success
Technological Capability	Experienced and knowledgeable employees Adapting new ideas Identify new and efficient ways of doing things Financial Limitation	Experienced and knowledgeable employees Adapting new ideas Identify new and efficient ways of doing things In-house research Financial Limitation	Experienced and knowledgeable employees Adapting new ideas In-house research Financial Limitation	Experienced and knowledgeable employees Adapting new ideas Identify new efficient ways of doing things In-house research Financial Limitation
Environmental Dynamism	Competition Diversity in employees Customer Needs & Feedback Market Expansion Product Demand Good Partnership and wider network	Competition Diversity in employees Customer Needs & Feedback Market Expansion Product Demand Good Partnership and wider network	Competition Diversity in employees Customer Needs & Feedback Product Demand Good Partnership and wider network Regulator Concerns	Competition Customer Needs & Feedback Market Expansion Regulator Concerns

Source: Field Data, 2019

On the basis of an analysis of the recurring themes, some key issues emerged that were deemed to affect innovativeness in the study firms. The thematic narratives presented were based on the study objectives that were earlier identified in Section 1.3. A detailed analysis follows under Sections 5.6.1 to 5.6.3.

5.6.1 Entrepreneurial Orientation and Firm Innovativeness

The findings from the case narratives suggested that the variables that influence innovativeness reflected the dimensions of entrepreneurial orientation (Lumpkin & Dess, 1996; George & Marino, 2011). These dimensions included autonomy, proactiveness, risk aversion and competitor aggression and were consistent with the study findings as detailed in Section 4.4.1. In 3 out of the 4 cases, the entrepreneurs started the businesses because they felt that they needed to be unique and "be their own bosses". In addition to being an own boss, one entrepreneur joined the business because members of his own community inducted him. This behaviour confirmed that the dimension of autonomy existed within the cases.

There was one instance whereby an entrepreneur was motivated by the desire to do something different and to be seen to be successful at it. This entrepreneur occasionally tried out different innovative products and processes and monitored the performance of the product changes in the market before adopting it. In one of the cases, the entrepreneur worked in a community social enterprise and individually tried out new innovations. Members within the group were encouraged to try out innovations but within the group's accepted norms of behaviour. This was an immigrant community who were sensitive to the local environment and preferred to be close-knit in their rendezvous.

One of the entrepreneurs ventured into the business because he deemed this as an opportunity to make money. The entrepreneurs subsequently took action to design innovative products to capitalise on the opportunity. All the cases demonstrated that there was an underlying motivation for the entrepreneur to start the business and generate innovation-backed products. In their study, Martinez-Roman & Romero (2017) argued that an individual's motivation played a critical role in a firm's innovativeness. This motivation was reflected through the dimension of proactiveness.

The cases revealed that the study firms subconsciously engaged in market intelligence gathering although they did not necessarily consider this as contributing to innovation. The cases needed to be aware of the market trends and also be ready to react to what the larger and more financially endowed competitors did. Most of the market intelligence was gathered through the website for the larger competitors and nondescript visits to competitor and potential customer premises. In a similar study, Prihadyanti (2013) established that innovation was generated by an established customer need and the desire to scale up the scope of operations of the firms being studied. The study further argued that some of the innovations were in response to a concern that had been identified by the customer and the action tended to be reactionary rather than proactive in nature.

In all the cases, the level of innovativeness was constrained by risk management considerations. All the four firms had limited sources of finances and were not keen on absorbing losses on the basis of experimental innovation. They wanted to invest in innovations that had assured markets. One of the entrepreneurs obtained finance from a relative and did not want to make losses. The other three cases started the businesses on the basis of their savings and were not keen on extensive experimentation with new products. The findings indicated that they preferred to deal with innovation that had been tried, tested and had assured markets. To avoid regulatory sanctions, the cases occasionally considered changes that were dictated by the licensing and regulatory agents. This further indicated that risk management affected the firm's disposition towards innovativeness. Risk taking is about taking well calculated decisions that have a probability of failure and high rewards if successful. It is about calculations of the benefits to accrue vis-a-vis the risk taken if a firm is to avoid the tag of being negligent. Indeed, one can be said to be a, 'dreamer" if one is highly innovative, but highly risk averse. However, one would be foolhardy to not consider the trade-off before diving into a risky venture that has not been ascertained.

All the cases indicated that they always considered their competitor actions in the design of their products. One case felt that they were in a very competitive environment and dealt with *giffen* goods. Therefore, they felt that as an entity, they did not need to invest in research but rather wait for the larger competitors to set the trends, which they subsequently copied. Another case viewed innovation as a key differentiator and therefore, spent considerable effort in establishing new designs and customer tastes. Their view was that lack of continuous innovation was a sure way to reduced customers interest and subsequent market demand. All the firms nevertheless spent their resources on predominantly on exploitative innovation. The findings indicated that incessant competitor awareness and reaction affected innovativeness. These circumstances ultimately pointed to a choice that needed to be made by the firm owners. Previous studies such as those by Braga & Braga, (2013) and Prihadyanti (2013) argued that decision making by the entrepreneur was important in SME firms being innovative.

5.6.2 Technological Capability, Entrepreneurial Orientation and Innovativeness

The findings from the individual cases suggested that internal organisational phenomena affected innovativeness in firms. To create an enabling environment for technological capability, firms grant their employees with different levels of autonomy. The cases inferred that even though the entrepreneurs were fairly independent in their decision-making, the level of autonomy granted to their staff was very limited. Three of the case studies indicated that the entrepreneurs did not feel sufficiently confident to empower their employees due to reasons varying from staff capability to potential business rivalry by competitors and even future entrepreneurial activity by staff. The level of autonomy extended to the staff varied with the complexity of the organisations.

Smaller organisations tend to be very conservative with the level of autonomy granted to their employees. In one case, the staff role was limited to production with no scope for customer interaction. The designs, standards and procedures were prepared and defined by the entrepreneur or his trusted senior manager. The main reason that the firms were reluctant to grant extensive autonomy to their staff was that they felt that they could easily be compromised by their competitors or even set up their own business units. An observation by Prihadyanti (2013) however, was that SMEs tended to be non-rational in their decision making, basing their judgment on intuition and non-objective views. However, larger and complex organisations were more liberal in the autonomy granted to the employees (Voeten, 2015). Nonetheless in all the organisations, employment of staff was on the basis of their individual productivity.

In as much as technology has seen a revolution in the past few years, the impact of this revolution was yet to be significantly felt in manufacturing SMEs in Kenya (KIPPRA, 2017). In all cases, the core activities were predominantly manual. The predominant use of technology in the cases was mainly to ease the support processes within the firms such as accounting or sales and marketing activities like identifying new competing products. There was very limited change to the technological approach in the rudimentary processing activities of the firms. In two instances, whereby technology had been adapted in the core activities, it was to such a limited scale and with a few firms that there was hardly any impact of economies of scale.

In all instances, the entrepreneurs stated that they were receptive to new ideas on products, processes and other changes to their operations. However, the level of financial investment in innovation was limited to activities that were safe and assured them of some level of certainly. All the four cases stated that they did not always have adequate capital and, therefore, they always made choices that were favourable for the protection of their investment. They consciously avoided risk and preferred proposals that were certain. In all the four firms, these innovative activities were mainly process-based. When asked whether they could consider investing in automated machinery that could produce higher volumes of products and at a faster pace, all the cases stated that they had very limited financial capital and thus could only prioritise other areas. When asked whether they had considered digitisation of their sales, all the entrepreneurs stated that they were satisfied with their immediate local markets and did not need to expand. These findings insinuated that the level of investment in technology was limited, thereby constraining technology-based innovativeness.

The repertoire of skills and experience available in the firms contributed to innovativeness. The highest individual's education level for entrepreneurs was primary level for one, secondary level for one other and tertiary level for the other two entrepreneurs. In all the cases, staff were employed with skills and experience level ranging from no experience to well-trained and educated. In one case where the entrepreneur had a primary level of education, he preferred experienced employees (irrespective of their education levels) to better-educated employees. Formal advanced level education was, therefore, not deemed to be a pre-requisite for one to be a long-term entrepreneur. This view contrasts the findings by Njiraini et al., (2018) which showed that the average number of years of education for a production worker were important factors to influencing innovation decisions in firms. Conversely, Radas and Bozic (2009) were not able to confirm secondary education as being essential to the process innovation.

Closer interaction with the entrepreneurs however, suggested that the entrepreneurs who had a higher level of education had a wider grasp on the environmental issues that affected their lines of business. For instance, one entrepreneur who had only primary school education, did not consider the need to innovate beyond what the customer desired. He relied exclusively on the customers' preference and narrated an experience where he tried innovating on a product, only for it to be rejected by the customer as unsuitable. He incurred losses as a result of this and was thus unenthusiastic about further exploratory innovation. On the other hand, an entrepreneur who had a tertiary college level education was always exuberant about trying out new ideas, which he consistently searched for over the internet although he had previously made some losses in some of the ideas. This corroborated the opinion of Martinez-Roman & Romero (2017), who argued that a higher level of education tended to be linked with a higher level of cognitive complexity and the entrepreneur's aptitude for technological immersion. They further argued that this aptitude encouraged creativity and innovativeness.

All the four cases did not consider intellectual protection for their innovation and as such none of their products had been protected. The reasons ranged from unfamiliarity with the process to not knowing if at all there were any benefits to be derived from intellectual protection. Two of the cases, had never heard of the process of intellectual protection before. These reasons were consistent with the reasons that were determined as holding back intellectual protection by Kiveu (2012).

Some studies have shown that basic Vocational Industrial Training is essential for harnessing the entrepreneurial skills of individuals (Duval-Couetil, 2013; du Toit & Gaotlobogwe, 2018). In the studies reviewed, three of the four entrepreneurs had previous basic industrial training in their line. The entrepreneurs acknowledged that the training equipped them with the necessary skills for their line of business. Although the fourth entrepreneur having had secondary level of education, had not had any formal vocational industrial training had gone through an apprentice programme that allowed him to develop his technical skills in the industry.

In-depth interviews with the key informants indicated that most firms preferred to hire their staff on a temporary basis rather than full time engagement. This was deemed to be a precautionary measure such that the firms could easily disengage their temporary staff when faced with adverse conditions. In particular, adverse economic conditions affected choices of investment that included talent recruitment in innovativeness. In all instances, well-experienced and skilled staff contributed significantly to innovativeness due to their previous exposure. In addition, the level of staff commitment and passion for their respective roles also affected innovativeness. These narratives are consistent with previous research findings, whereby internal factors provided both a stimulus and challenge in innovativeness (Ndemo & Aiko, 2016). The cases therefore, did not establish a significant effect of technological capability on firm innovativeness. In England, (Ngugi, Johnsen, & Erdelyi, 2010) established that technological capability affected product innovation in the SME cases studied.

5.6.3 Environmental Dynamism, Entrepreneurial Orientation and Firm Innovativeness

Innovativeness within SMEs was affected in varying intensities by a myriad of external variables. Interviews with case study firms indicated that market dynamics stood out as a key factor. This was predominantly caused by competition by other firms. Closely tied to this were the customer behaviour and patterns. Shifts in customer behaviour affected the market behaviour, thereby affecting a firm's possible reaction to such consequences. Occasionally, the product consumption patterns expanded or shrunk. Furthermore, changes in consumer tastes also affected how the firm postured itself to capitalise on the opportunities. In all the cases, the respondents previously had a nasty experience, and their innovativeness was restrained by their experience with the environmental interactions.

All the firms interviewed stated that they spent a considerable amount of time, studying the patterns and behaviour of their customers. They subsequently spent considerable effort and resources adjusting their products and models to the expectations of their customers. In 3 out of the 4 cases, the firms were consistently concerned about imported products that often wiped out the local producers' margins.

One firm occasionally tried untested innovation, but did not benefit from this innovation as competitors who thereafter commercialised it subsequently picked up the innovation. None of the firms had tried to register patents or trademarks. The firms said that they were unaware of the process and the benefits for intellectual property protection. The extent of the firm's cooperation with external partners was very limited. The relationship between the firms and public institutions was mostly limited to licensing and regulatory in nature. Only one firm had worked with public institutions on identification of new markets and areas of opportunities. The other three firms viewed other players as competitors and had limited cooperative interactions with them.

The findings suggest that cooperation and strategic alliances were limited to the extent that the firms had to discern immediate direct benefit before they could cooperate. The findings indicated that there was an impact of environmental dynamism on firm innovativeness in so far as customer demands and tastes were concerned. The findings also suggested that in as much as the cases were conscious of changes in the environment, they had varied reactions to changes, and this depended on their interpretation of their likely impact. There were instances when they had to scale down their investments in new products or processes when their customers were not enthusiastic about them.

5.7 Synthesis of the Thematic Analysis of the Cases

A comparison of the findings obtained from both study methods corroborates the fact that there is a significant behavioural disposition that affects an entrepreneur's inclination towards innovativeness. This disposition manifests itself in entrepreneurial orientation. The field survey indicated that 53% of the innovation process was conceptualised at the entrepreneur and senior management level. This position was further accentuated by the case findings, which indicated that there was an inherent passion that made the entrepreneurs to be innovative.

The case findings indicated that risk taking attenuated the level of innovativeness. Prior to implementation, risk taking was always considered on the basis of financial trade-off. The firms studied were apprehensive that their individual market shares were small and were not inclined to take un-proportionate risk. This position was further accentuated by the fact that more than 60% of the funds for innovation were from own sources, and a further 17% was from loans. Moreover, this resonates well with the survey responses on the statements on risk taking, because many entrepreneurs made choices on the basis of financial trade-offs. Risk taking as a dimension, was found to affect entrepreneurial orientation, which in turn, significantly affected firm innovativeness.

The use of technology varied with the extent of the complexity of the firm as well as the sophistication of the customers. The findings from the cases showed a minimal level in the use of technology. The survey indicated mixed outcomes on the use and outcome of technological capability in firm innovativeness. This suggests that the extent and use of technology varied with individual firms and environmental situations. Furthermore, access to financial resources was also determined to be critical. This was observed in the case studies as well as the field survey where 59% of the sampled firms stated that they used their own funds and that 45% of the respondents highlighted finance as a challenge to innovation. Access to technology and adequate financial resources created a positive organisation ecosystem.

The cases also indicated that the external market influenced innovativeness. All the cases indicated that SMEs are market-receptive to new innovation, constantly striving to be aware of what is contemporary. All the cases stated that the most notable influence in innovativeness was customer demands and tastes. The cases however, indicated little interactions between the cases and other external strategic partners, public research institutions and other alliances in innovativeness. Singularly, changes in the environment did not immediately trigger change in innovativeness, but the changes could have a compounded effect.

Comparatively, a similar case study by Gilbert (2007), categorised factors that affect firm innovativeness in Japan to workplace factors, environmental and strategic factors. An interrogation of the construct of the workplace and strategic factors established they were similar to the technological capability as a variable in this study. On the other hand, the environmental factors were similar to the environmental dynamism as a variable in this study. Gilbert (2007) concluded that it is imperative that conversations on the causes of firm innovativeness be multidimensional and that over and above this, entrepreneurs continuously need to develop and nurture internal and external environments for innovativeness to thrive.

Similarly, Braga & Braga (2013) and Prihadyanti (2013) concluded that inasmuch as the process of innovation required both internal and external parties, the role of the owner was very dominant in making the entire process work. This was observed in the case of Omega and Kappa firms who did not consider export-oriented markets for their products purely on the basis of the firm owner's level of interpretation of the market dynamics.

The case studied concluded that innovation is an iterative process that is spurred by creativity. In the model, creativity and idea generation are triggered by the entrepreneurial orientation of the firm and entrepreneurs, as well as an identified market need. The firm then goes through a series of internal reflection steps that ultimately are matched to the firm's technological capability. It is at this stage that the firm will determine whether it has adequate resources to support the innovation. These resources will be either tangible or intangible and may be internally or externally sourced. Upon this determination, the next stage is production and a new prototype innovation is produced. The stage is a determination on to whether or not, there has been a market acceptance. Ultimately, the firm next has a choice of determining whether it can commercialise the innovation or not.

The innovation is captured pictorially in Figure 5.1. It shows that an innovation might not diffuse as fast as it would ordinarily have done under enabling environments.

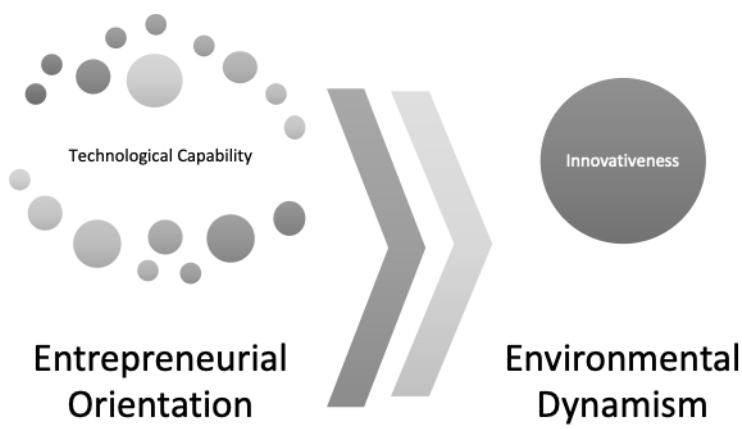

Figure 5.1: The Innovation Process
Source: Field Data, 2019

As observed in Figure 5.1, the creative need for a firm is affected by existing technological capability. This then defines a firm innovativeness that exists in a particular environment. The creative needs define the firm's entrepreneurial orientation whereas the environmental dynamism is a function of turbulence in the environment.

5.8 Chapter Summary

The chapter provides insights into the qualitative research carried out. It starts by providing a justification for the qualitative research method applied. It then provides the case design and methodology used in the case research. After a discussion on the methodology, the chapter presents the findings of the case narratives. It also brings together a thematic discussion of all the case narratives as they were presented by the cases examined. Further to this, it triangulates the insights obtained with the findings of the survey research. The next chapter provides a discussion of all the significant findings of the research.

CHAPTER SIX

DISCUSSION OF FINDINGS

6.1 Introduction

Chapter Six presents a synopsis and discussion of the combined findings of the field survey and case studies. In the questionnaire survey, both a descriptive and an inferential approach were adopted to provide findings that led to insights on the objective of the study. In the case study, a descriptive approach was adopted to obtain insights.

The chapter is structured along the objectives of the study and the findings systematically discussed on this basis. In the first instance, a discussion is done on the findings relating to the relationship between entrepreneurial orientation and firm innovativeness. Secondly, the findings on the relationship between the effects of technological capability on the relationship are discussed. In the third section, the findings on the effect of environmental dynamism on the relationship between entrepreneurial orientation and firm innovativeness are discussed. Finally, the next section discusses the findings on the joint effect of entrepreneurial orientation, technological capability and environmental dynamism on firm innovativeness.

6.2 Entrepreneurial Orientation and Firm Innovativeness

The first objective sought to establish the influence of entrepreneurial orientation on firm innovativeness. The study failed to reject the hypothesised relationship between entrepreneurial orientation and firm innovativeness in manufacturing SMEs in Nairobi. Previous studies had identified a need to further conceptualise the relationship between entrepreneurial orientation and firm innovativeness (Hult et al., 2004; Avlonitis et al., 2007; Perez-Luno et al., 2010).

The study showed that entrepreneurial orientation manifests itself in firm innovativeness. The manifestation showed in different ways as a result of the various dimensions that influence the composition of entrepreneurial orientation. Entrepreneurial orientation was theorised as a second order construct. Four dimensions, namely autonomy, proactiveness, risk taking and competitor aggression were studied as the first order constructs. The relationship between entrepreneurial orientation and firm innovativeness was therefore studied when the dimensions were both in a disaggregated and an aggregated form.

Previous research showed that divergent opinions continued to highlight the inconclusiveness of the effect of the dimensions of entrepreneurial orientation on innovativeness. In particular, even though some studies established that risk taking did not have a significant effect on performance and in some cases innovativeness (Avlonitis & Salavou, 2007; Rigtering, 2013; Ejdys, 2016; Katialem et al., 2018), others, conversely indicated that risk taking had a significant effect on SME innovativeness (Perez-Luno et al., 2010; Joshi et al., 2015; Gudda, 2017). This study established that risk taking had the highest impact on firm innovativeness and this was statistically significant. This finding was consistent with the views of the latter group of scholars.

The cases stated that they did not always have adequate capital, and therefore, they consciously avoided risk and preferred proposals that were certain. This is detailed in Section 5.6.2 of this study, confirming that SMEs being rational entrepreneurs took measured risk in their choices. Typically, SMEs were conscious about specific problems that they need to address. This was consistent with the findings by Rauch et al., (2009), which concluded that they were uncertain about the trade-off between the investment in the innovation as compared to the final outcome. The study established in Section 4.4.1 that risk-taking affected innovation $t\ (4,182) = 2.145,\ p < 0.05,\ \beta = 0.249$. This innovation could in turn, be either exploratory or exploitative, depending on a firm's unique circumstances. This was similar to the findings by Perez-Luno et al., (2010). As explained in Section 5.6.1, the cases indicated that the firms preferred to deal with innovation that had been tried and tested, indeed, preferring exploitation innovation to exploitative innovation, as they considered it to being less risky.

According to DOI, innovation diffuses as a result of overcoming the anxiety on the attendant risks by the entrepreneurs (Roger, 1995). SMEs are often minor players in the market. They will rely on external support to trigger an *environmental persuasion* that allows the innovation to spread. As demonstrated in Figure 5.1, there is a possibility of an innovation having a stunted trajectory of growth, if adequate internal and external support is not in place. This support will only be possible if it is not deemed to be risky.

There is no concurrence in the discourse around the influence of proactiveness on innovativeness. Whereas some previous research established that proactiveness significantly affected innovativeness (Avlonitis & Salavou, 2007; Joshi et al., 2015; Ejdys; Gudda, 2017), the influence was not similar in all cases. For instance, Joshi et al., 2015 showed that proactiveness had an inverted curvilinear relationship with firm innovativeness in US technology-based firms. This suggested that proactiveness increased innovativeness to a certain level and thereafter, proactiveness was likely to restrict the innovativeness in a firm. Other studies concluded that there was linear relationship between proactiveness and innovativeness (Perez-Luna et al., 2010; Ejdys, 2016; Gudda, 2017). Conversely, this study found that even though proactiveness had a positive coefficient on the regression model *$t = 0.765$, $p < 0.05$, $\beta = 0.069$*, it was not able to confirm that proactiveness as a disaggregated sub-variable affected firm innovativeness. Katialem et al., (2018) had similar findings on proactiveness. The cases remarkably suggested in Section 5.6.2 that the firms deliberately provided funds and resources to stimulate innovativeness, thereby revealing proactivity. This latter finding was consistent with the findings by Covin and Slewin (1989) and Wiklund & Shepherd, (2005), who posited that proactiveness of entrepreneurs was dependent on an enabling environment for it to stimulate innovativeness. Further research work is required on these constructs.

Previous studies have indicated that the level of autonomy in a firm, varied with the complexity of the firms (Lumpkin & Dess, 1996; Wiklund & Shepherd, 2005; Yi-Ying, 2011; Voeten, 2015). It was nevertheless observed in Section 4.2.3 that the study sample had a mix of small and larger firms. Whereas, in Section 4.2.8, it had been established that the size of a firm had a relationship to innovativeness, a position that was consistent with similar studies, for instance, by Hurley & Hult, (1998), this study found the relationship between the autonomy and firm innovativeness to be inconclusive.

Furthermore, in Section 4.3.1, autonomy as a dimension, was found to have a positive coefficient, but the study was unable to confirm that it had a significant effect on firm innovativeness, *$t=1.486$, $p> 0.05$, $\beta= 0.200$*. This contrasts to the findings by Katialem et al., (2018) that established a relationship between autonomy and firm growth. In Section 5.6.1, the case narratives by the entrepreneurs nevertheless confirmed that they made most of the decisions on the firm. There is a need for additional conceptualisation on these specific constructs with specific reference to the SMEs.

Previous empirical studies by scholars indicated that incessant competitor awareness and reaction affected innovativeness (Lumpkin & Dess, 1996; Callaghan & Venter, 2011). Furthermore, Katialem et al., 2018 established a relationship between competitor aggression and growth of SME firms. Moreover, in Section 4.4.1, the findings indicated that the disaggregated competitor aggression dimension had a positive coefficient in the regression model, but did not have a significant effect on firm innovativeness, $t= 0.366$, $p> 0.05$, $\beta= 0.032$. Indeed, in Section 5.6.1, the firms indicated that their inclination towards being competitively aggressive varied with the individual firms. This study concluded that SMEs were not in a market dominant position and being vulnerable to external turbulence, made decisions on the basis of their individual circumstances. This is an area in which additional research was required to further conceptualise the relationships.

Whereas individual dimensions of autonomy, proactiveness and competitor aggression were not statistically significant, when combined with risk taking dimension, the consolidated model was statistically significant, F (4,182) = 6.655, $p < 0.05$. This study inferred that there is an interacting action between the various dimensions of entrepreneurial orientation that affects firm innovativeness. In addition, the aggregated model did not reject the hypothesised relationship between entrepreneurial orientation and firm innovativeness. The model was found to be statistically significant, $F(1,182) = 24.423$, $p < 0.05$ thereby failing to reject the hypothesised relationship that entrepreneurial orientation significantly affected firm innovativeness. This study therefore adds to the existing body of empirical knowledge that confirms that the construct of entrepreneurial orientation affects firm innovativeness.

6.3 Entrepreneurial Orientation, Technological Capability and Firm Innovativeness

The second objective sought to establish whether there is an intervening influence of technological capability on the relationship between entrepreneurial orientation and firm innovativeness. Technological capability was a composite indicator that included the tangible and intangible resources that were available within the firm. The construct of technological capability was constructed around the internal factors that influence decisions and implementation of firm innovation. Further to this, the case studies corroborated the findings of the questionnaire survey.

The descriptive findings of the study as presented in Section 4.2.8 established that the number of employees (an indicator of firm size) positively affected firm innovativeness $R(175) = 0.175, p < 0.05$. Similarly, the study findings also suggested the financial budgetary resources set aside and utilised for creativity also affected firm innovativeness, $R(206) = 0.312, p < 0.01$. In addition to this, the findings in Section 5.6.2 indicated that the firms set aside funds in pursuit of innovative activities once they were satisfied about the expected returns, but avoided investments with uncertain technological capability outcomes due to inadequate financial resources.

These findings were consistent with those of Radas and Bozic (2009), Julienti-Abu Bakar and Ahmad (2010) and Demirkan (2018). There were other previous studies that established a relationship albeit without concurrence between firm size and innovativeness. For example, whereas Radas and Bozic (2009) posited that smaller firms were more innovative, Mazzarol et al., (2010) argued that larger firms were more innovative. Other scholars such as Martinez-Roman and Romero (2017) posited that firm sizes and innovativeness initially increase together and thereafter innovativeness stagnated and even declined upon increased sizes. Some scholars such as Chandy and Telis (2000) and Dougherty and Hardy (1996) posited that bureaucracy, lethargy and complexity crept upon the firm as it grew and then subsequently affected continued growth.

This notwithstanding, additional findings from the cases narratives showed that that the level of technological capability in the firms was low. The study findings in Section 4.2.5, showed that more than 60% of the financial resources were internally generated, albeit being limited in scale. This finding was consistent with those of previous studies like Radas and Bozic (2009), who similarly established that most of the financial resources were internally generated. Accordingly, firms only invested in technology when they were certain of a direct impact on their bottom line. Comparatively, studies by Renko et al., (2009) and Ruiz-Ortega et al., (2013) established a relationship between technological capability, entrepreneurial orientation and firm innovativeness. In addition, Chang et al., (2011) concluded that technological capability allowed innovation to thrive. Further to this, Zhou & Wu, (2010) concluded that technological capability had an effect on innovativeness, further attesting to the view that the relationship between exploitative and explorative innovativeness was unclear.

Zhou & Wu (2010) further went on to posit on the basis of their research that innovativeness increased correspondingly with additional technological capability and that after a certain stage, additional increases caused a decline in firm innovativeness. This notwithstanding, Acosta et al., (2012) established that entrepreneurial orientation played a significant mediator role in the relationship between technological capabilities and innovativeness.

SME firms with limited resources were discouraged from venturing into exploratory innovation unless they were sure about the outcome of the innovation (Zhou & Wu, 2010). Indeed, some scholars have argued that firms with more resources could spread the risk of R&D loss in the event of such occurrence (Kiveu, 2017). Additionally, the case narratives indicated that there was little automation in processing and operations for the cases that were studied. In these cases, automation was limited to accounting, sales and marketing operations. These findings were consistent with previous research findings that indicated that internal factors provided both a stimulus and challenge in innovativeness (Ndemo & Aiko, 2016).

Whereas, the findings in Section 4.2.4 of this study showed that over 84% of the SME firms had continuously changed their original operating model over time, Section 5.6.2 indicated that these changes were in response to certain stimuli. Furthermore, KIPPRA (2017) confirmed that the use and impact of technology was not significantly felt across manufacturing SMEs in Kenya. This study inferred that the more resources a firm had at its disposal, the more it enhanced its technological capability and subsequently became innovative. Moreover, the study further opined that the diffusion of available technology (innovation) in manufacturing SMEs was slow. These contextual context in these phenomena create a potential research area.

This study found that intellectual protection and subsequent commercialisation of innovation were not very well-embraced by the entrepreneurs. This pointed to a lack of appreciation of the importance of intellectual protection and its subsequent opportunities. Their reasons were outlined in Table 4.9 and were similar to those established in a previous study by Kiveu, (2012). Some of the reasons attributed for this disinterest were that they considered the process to be complicated or too bureaucratic.

Incidentally, all the cases reviewed either felt that they did not have adequate knowledge nor had a need for patenting. This study opined that one of the reasons for low uptake on the patenting was the low approval rate, which easily discouraged innovators. There is divergent opinion on the impact of intellectual property protection on firm innovativeness (Reichman, 2009; Williams, 2010; Hussain & Terziovski, 2015; Mrad, 2017; Ndicu, 2018). This study was not able to confirm either of the positions in the discourse.

The inferential part of this study could not confirm that technological capability had a mediating effect on the relationship between entrepreneurial orientation and firm innovativeness. Indeed, the structural equation model indicated that whereas there was a significant relationship between entrepreneurial orientation and technological capability, the relationship between entrepreneurial orientation and firm innovativeness was inconclusive. The study further found that the endogenous variances in the findings to be proportionately large. This study attributed the incommodious endogeneity to ongoing discourses on the complexities around measurements on SME innovation (Bell & Pavitt, 1993; Vonartas & Xue, 1997; Acha, 2000; OECD, 2005; Coombs & Bierly III, 2006; Khayyat & Lee, 2015; Salisu & Baker, 2018; Poudel et al., 2019). This is potentially a future research area.

6.4 Entrepreneurial Orientation, Environmental Dynamism and Firm Innovativeness

The third objective of the study sought to establish whether there is a moderating influence of environmental dynamism on the relationship between entrepreneurial orientation and firm innovativeness. In the study, environmental dynamism was conceptualised as the variation of the external environmental conditions in which the firms operated. Accordingly, these conditions may affect the firms individually or the entire industry.

Previous scholarly findings concluded that environmental dynamism affected innovativeness (Khan & Manopichetwattana, 1989; Chang et. al., 2011; Ruiz-Ortega et al., 2013; Staniewski et al., 2016; Pustovrh, et al., 2017; Zhai et al., 2018). Furthermore, Pustovrh, et al., 2017 established that there was a strong linkage between external factors and innovativeness. This latter finding was inconsistent with this study's findings which suggested that within the model as displayed in Table 4.28, coefficient of environmental dynamism was found to be statistically insignificant, $t= -1.249,\ p> 0.05,\ \beta = -1.013$, suggesting that by itself, it does not affect firm innovativeness. However, the composite overall model in the relationship was statistically significant, $F\ (3,182) = 9.664,\ p<0.05$ and thus failed to reject the hypothesised relationship that environmental dynamism had a moderating influence on the relationship between entrepreneurial orientation and firm innovativeness.

This finding leads to the notion, that there was an interacting effect on the relationship leading to the statistical significance. Furthermore, in Section 5.6.3, the cases stated that their decisions on innovation are affected by the external environmental dynamism. Numerous studies have previously shown that environmental dynamism had a moderating influence on the external environment under which a firm operates, thereby triggering a reaction that causes the firms to be innovative (Miles et al, 2000; Zhou, 2006; Wijbenga & van Witteloostuijn, 2007; Okeyo, 2014; Bouncken et al., 2014). On the other hand, Bodlaj & Carter (2018) concluded that innovation had a mediating relationship on the relationship between environmental dynamism and firm innovativeness. This is an area that would require additional conceptualisation to confirm the relationship of the two constructs.

The descriptive findings in Section 4.3.3 of the study showed that many SMEs believed in diversity of staff as it offered them an opportunity to share their individual experiences that had been garnered elsewhere in addressing challenges unique to the firm, *M= 3.89, CV= 29.6%, s= -0.838, k= 0.004*. Moreover, in Section 5.6.2 the cases confirmed these findings and that they did this as a way of tapping the intrinsic skills and knowledge of employees rather than having to spend resources on training others. Studies by Kiveu (2017) indicated that entrepreneurs preferred employing knowledgeable staff. In addition, Kiveu's study established that 71% of the process innovations were as a result of modifications of other firms' processes, thus enhanced by the employment of staff from other peer organisations.

As presented in Section 5.6.3, that case narratives stated that apart from complying with the licensing requirements of the regulators, there was minimal interaction between SME firms and public bodies in pursuit of innovation. Similarly, the cases stated that discussions with the industry partners and other alliances were often limited to discussions on enablers for market opportunity and infrastructural requirements. Kiveu (2017) established that firms had innovation partners that they worked with from time to time rather than public institutes.

In the analysis of the case narratives in Section 5.7, it was concluded by the study that the reactions by the individual SMEs are hardly predictable as the firms are substantially different and go through a series of iterative decisions. Due to the structure of the market and industry, SMEs are largely price takers and adjust their conduct on the basis of interpretation of the market signals. In spite of this, innovativeness within SMEs was affected in different ways by innumerable external variables. This was predominantly triggered by competition from other firms. It was also affected by changing customer behaviour and patterns. Indeed, in Section 5.5, all the case firms said they had to scale down new innovations as a result of the markets either being lukewarm or negative. From the foregoing, it is evident that the discourse on the cause and effect of innovation in SMEs is still open and provides a rich research area.

6.5 Entrepreneurial Orientation, Technological Capability, Environmental Dynamism and Firm Innovativeness

The fourth objective sought to establish the joint effect of entrepreneurial orientation, technological capability and environmental dynamism on firm innovativeness. This study failed to reject the hypothesised relationship that there is a joint effect of entrepreneurial orientation, technological capability, environmental dynamism to affect firm innovativeness. This finding confirmed previously empirical studies such as Keizer et al., (2002) and Neely and Hii, (2012) that established that innovativeness is affected by a myriad of factors that range from internal, external and even the firm's subsequent reaction to the available factors.

Additionally, tough operating environments that have been characterised by dynamic technological shifts and severe competition have not hindered innovativeness (O'Regan & Ghobadian, 2005; Yi-Ying, 2011). Specifically, Subrahmanya (2007) and Khayyat & Lee (2015) established that technological capability and environmental dynamism were key prerequisites for innovativeness. Martinez-Roman & Romero (2017) posited that there was a combined effect of internal organisational as well as external circumstances that when combined with the owner's disposition affected a firm's innovativeness.

According to the findings in Section 4.4.4, the individual variables had an interacting effect that ultimately affected innovativeness. Even though the model was statistically significant, $F(3,182) = 3.776, p < 0.05$, the findings indicated that only 11.9% of the firm innovativeness was explained by the independent variables studied. This suggested that there were additional variables that accounted for 88% of the dependent variables that influenced innovativeness. This is consistent with the argument within the study and from previous studies that there are internal and external variables that affect firm innovativeness.

According to Pustovrh et al., (2017), individual firms were unable to trigger successful diffusion of an innovation cooperation between the individual firms, their peers, and support from other stakeholders. This study established that peer networks were influential in innovation decisions. In addition to this, one of the cases confirmed that they occasionally spent time with government officials. All the cases however confirmed that their liaison with government officials stemmed from regulatory aspects. From the questionnaire survey findings, even though there were frequent interactions between them, action to spur them into creativity were not observed. There was a similar scenario within their industrial associations, where it was acknowledged by the firms in Section 5.6.3 that there were certain norms that were adhered to. It was not clear what role these institutions played in assisting the firms to embrace innovation. By their nature of being public institutions, it transpired in the case studies that the institutions played a moderating role. The impact of these changes on the extant institutions such as the non-regulatory innovation partners and other stakeholders was not observed in the study.

The findings confirmed that there was a joint relationship of the four variables that affected firm innovativeness. However, due to the inconclusiveness of the effect of technological capability on the relationship between entrepreneurial orientation and firm innovativeness in the earlier hypothesis, there is scope for future research on the influence of technological capability.

6.6 Chapter Summary

The chapter provides valuable insights about the findings of both approaches and their relationship to firm innovativeness. A discussion of the variables affecting firm innovativeness is derived from the study findings and other extant studies that have been done in the area. The discussion also extends or supports the theoretical constructs that have been previously developed in various areas. The next chapter provides a summary of recommendations and conclusions.

CHAPTER SEVEN

SUMMARY, CONCLUSION AND RECOMMENDATIONS

7.1 Introduction

This chapter provides a summary of the findings of the research. It is an amalgamation of both the qualitative and quantitative research findings from the study. It is also a combination of the outcome of both descriptive and inferential analysis that was carried out. The configuration of the discussion is guided by the study objectives and resultant study hypothesis. Case studies were used as an attestation and triangulation of the findings established by the earlier analysis.

This then dovetails into a raft of conclusions and recommendations arising from the research. The discussions are guided by the general and specific research objectives. The recommendations are guided by their applicability to practitioners, policy makers and scholars. Finally, suggestions on the limitations of the research as well as suggestions for further research are provided at the end of the chapter.

7.2 Summary of Findings

The study adopted a multi-method approach and as such diverse findings were obtained at different levels. The unit of analysis was the small and medium enterprise firm in the manufacturing sector in Nairobi. Two hundred and thirty seven SME firms were studied in the field survey. In addition to these, four firms were purposefully selected from the field survey samples and individually examined as case studies. The number of years of operation ranged from two to seventy years. The study firms had a minimum sales turnover of Kes.500,000 and maximum annualised turnover of Kes.990 million. As part of the analysis of the general profiles of the firms, a positive relationship was established between the number of staff employed and firm innovativeness. The study also established that the firms set aside between 0 and 75% in financial resources for creativity and innovation. A further analysis revealed that there was a positive correlation between the set-aside funds and firm innovativeness. The financial resources used for innovativeness were mostly internally generated.

Three independent and one dependent study variables were identified, conceptualised and studied. Entrepreneurial orientation was identified as the first independent variable and was conceptualised as the underlying disposition of a firm that will create a capability to rejuvenate a firm in manner that it can overcome external current and future adversities (Miller, 1983). In line with the research by Lumpkin & Dess (1996), entrepreneurial orientation was further dimensioned into four sub-variables, namely autonomy; proactiveness; risk taking and competitor aggression. Innovativeness was not considered as an independent variable in this study.

Technological Capability was conceptualised as the second independent variable and was considered as the internal state of readiness to accept change and nurture innovation. Environmental Dynamism was conceptualised as the change of external circumstances under which a firm operates. Firm innovativeness was conceptualised as the continuous process that would allow a firm to create a new product, service or process that can subsequently be commercialised for an economic or social benefit. A summary of the inferential findings of the study objectives is provided in Table 7.1.

Table 7.1: Summary of Findings

Study Objective	Hypothesis	Findings	Interpretation
Establish the influence of EO on innovativeness	H1: Entrepreneurial Orientation significantly affects Firm Innovativeness in Manufacturing SMEs	The study did not reject the hypothesis that Entrepreneurial Orientation significantly affects Firm Innovativeness in Manufacturing SMEs in Nairobi County, Kenya.	Study confirmed that Entrepreneurial Orientation significantly affects Firm Innovativeness in Manufacturing SMEs
Establish whether there is an intervening influence of technological capability on the relationship between EO and innovativeness	H2: Technological Capability intervenes the relationship between Entrepreneurial Orientation and Firm Innovativeness in Manufacturing SMEs	The study rejected the hypothesis that Technological Capability intervenes the relationship between Entrepreneurial Orientation and Firm Innovativeness in Manufacturing SMEs in Nairobi County, Kenya	Study did not confirm that Technological Capability intervenes in the relationship between Entrepreneurial Orientation and Firm Innovativeness in Manufacturing SMEs
Establish the moderating influence of ED on the relationship between EO and innovativeness	H3: Environmental Dynamism moderates the relationship between Entrepreneurial Orientation and Firm Innovativeness in Manufacturing SMEs	The study did not reject the hypothesis that Environmental Dynamism moderates the relationship between Entrepreneurial Orientation and Firm Innovativeness in Manufacturing SMEs in Nairobi County.	Study confirmed that Environmental Dynamism moderates the relationship between Entrepreneurial Orientation and Firm Innovativeness in Manufacturing SMEs
Establish the joint effect of EO, TC, ED on Firm innovativeness	H4: Entrepreneurial Orientation, Technological Capability, Environmental Dynamism have a joint significant effect on Firm Innovativeness in Manufacturing SMEs	The study did not reject the hypothesis that Entrepreneurial Orientation, Technological Capability, Environmental Dynamism have a joint significant effect on Firm Innovativeness in Manufacturing SMEs in Nairobi County.	Study confirmed that Entrepreneurial Orientation, Technological Capability, Environmental Dynamism have a joint significant effect on Firm Innovativeness in Manufacturing SMEs.

Source: Field Data, 2019

Inferential analysis was used to study four specific objectives that involved four variables namely, entrepreneurial orientation, technological capability, environmental dynamism and firm innovativeness. Four pairs of null and alternate hypothesis for testing were developed on the basis of the objectives. The study test findings for three objectives were statistically significant and therefore their associated alternate hypotheses were not rejected.

The test findings for the second objective were however statistically insignificant leading to a rejection of the alternate hypothesis. These manifestations were subsequently triangulated and confirmed by the case studies in the research. The case narratives indicated that various dimensions of entrepreneurial orientation and environmental conditions influenced innovativeness. The case narratives however did not confirm the association of technological capability with innovativeness.

7.3 Conclusion

The study sought to establish the factors that influence innovativeness within manufacturing SMEs in Kenya. The study had four specific objectives namely; to establish the relationship between entrepreneurial orientation and their firm innovativeness; assess the mediating effect of technological capability on the relationship between entrepreneurial orientation and firm innovativeness; determine the moderating effect of environmental dynamism on the relationship between entrepreneurial orientation and firm innovativeness; establish the joint effect of entrepreneurial orientation, environmental dynamism, and technological capability on firm innovativeness of manufacturing SMEs in Nairobi.

The guiding philosophy of the research was realism approach. The study was anchored on five theories namely General Systems Theory as the main anchor, the Resource Based View, the Industrial Organisation Theory and the Institutional Theory of Organisations. Four study hypotheses were formulated. Entrepreneurial orientation was conceptualised as affecting firm innovativeness. In addition, technological capability was conceptualised as having a mediating influence whereas environmental dynamism had a moderating influence on the relationship between entrepreneurial orientation and firm innovativeness. A triangulated research design was adopted. Stratified random sampling was applied and a series of descriptive and inferential analyses were carried out on the primary data that was collected. The study also purposively identified and qualitatively studied four cases to triangulate the earlier findings.

The study showed that entrepreneurial orientation manifested itself in various ways in firm innovativeness. Even though three dimensions of entrepreneurial orientation were not found to have a significant effect on firm innovativeness, the study established that there was an overall interaction that made entrepreneurial orientation have a significant effect on firm innovativeness. The study further established that risk taking dimensions had the highest impact on firm innovativeness. The mediating effect of technological capability on the relationship between entrepreneurial orientation and firm innovativeness was inconclusive. The study further confirmed that environmental dynamism had a moderating influence on the relationship between entrepreneurial orientation and firm innovativeness. The study further confirmed that the joint relationship between entrepreneurial orientation, technological capability, and environmental dynamism had an effect on firm innovativeness. These findings were triangulated by the qualitative case studies.

The study infers that firm innovativeness is a function of entrepreneurial orientation, internal circumstances and external variables. The study findings suggested that SMEs were able to quickly adopt changes that were suitable to their internal strategy. This lends credence to GST, which posited that entities adapted to prevailing circumstances thereby being able to attenuate or accentuate their impact. In particular, the study confirmed that innovation was affected by both internal and external factors, thereby adding to the body of knowledge on OIM. Due to the inconclusive nature of the findings on the influence of technological capability, the study could not confirm the influence of DOI. The study is persuaded by the position taken by Gilbert (2007) that advocated for a multi-dimensional approach to conceptualise firm innovativeness.

The study was also able to add to the corpus of knowledge with respect to the Industrial Organisation Theory. By demonstrating that firms reengineer their internal structures, thereby behaving differently so as to overcome the prevalent market conditions. This is consistent with the SCP paradigm. Moreover, this behaviour is quite iterative and consistent with Game Theory. These behavioural changes depended on the available institutional support thereby a manifestation of ITO. *Fait accompli*, such changes, accompanied by appropriate institutional reforms would offer appropriate skills and external markets for the additional changes in products or services offered (GOK, 2015; KAM, 2019; Lafuente, 2018).

7.4 Implications of the Study Findings

The implication of this study on the anchoring theories is discussed and thereafter a discussion of recommendations. The study identified a raft of recommendations based on three areas, namely knowledge, practice and finally, policy that could be considered and applied. The contribution to the knowledge is predicated on the existing knowledge. It fortifies and seeks to extend the various arguments across the various theoretical foundations of the study.

On the other hand, contribution on practice is based on the basis of observation of the firms that were studied. A comparison is subsequent inferences is made from other previous, but similar studies that were carried out on SME innovativeness. Finally, a contribution is made to policy on the basis of the view and opinions made by the respondents as well as a review of previous research on similar topics.

7.4.1 Implications of Study to Anchoring Theories

The study was anchored on four theories namely the general systems theory of which open innovation model and diffusion of innovation theory were the main components. It was also anchored on the resource-based view, the industrial organisational theory and the institutional theory of organisations.

The need for research on open innovation in SMEs is undoubtedly gaining currency. The study was been able to demonstrate that firms did not operate in isolation from their peculiar environments but were receptive to external and internally developed ideas. Being perforated entities, there is a consistent inflow and outflow of ideas and information (Neely & Hii, 2012). The findings from the study suggested that, SMEs were able to quickly adopt changes that were suitable to their strategy. This supports OIM, which is predicated on the continuous absorption of external ideas to regenerate the existing ones. This is plausible, bearing in mind that under OIM, there is a continuous interplay of various ideas and factors that ultimately affect the outcome. Interplay of ideas flourished on the basis of entrepreneurial orientation. This can be said to be a reaction to external circumstances and aligned to Open Innovation, whereby firms continuously adapt to ideas and their knowledge of what the external competition and industry are doing (Chesbrough, 2003).

The study established that firms have an established network of innovation partners. Accordingly, this study opines that the distribution of innovation partners exemplifies OIM albeit with limited interaction with public academic and research bodies. Furthermore, the cases demonstrated that a firm's complimentary reaction is affected by its perceived view of the subsequent competitor and customer behaviour. Synonymous to Game Theory, these reactions could lead to the desire to have either an expanded, shrunk or modified production. There is a continuous interplay of the study variables, leading to the continuous need for innovativeness within firms. This further lent support to the Game Theory.

On the basis of the findings in the cases, the study opined that firms were sensitive to the reactions of their competitors and customers and therefore this formed part of their inherent operational strategy. Moreover, these reactions were predicated by the firm's basket of unique resources that were in line with the Resource Based View (Wernerfelt, 1995). Technological capability created a competitive advantage for the firms and different combinations of resources acted as stimulants to innovativeness. In as much as no inferential relationship between technological capability and firm innovativeness was established, the cases narratives indicated that inadequate resources led to innovativeness being stifled. Contrary to the one of the critiques highlighted in Section 2.24, the findings of the study provided support to the Resource-Based View, as it was able to demonstrate that a firm's decisions were a function of its limited resources, of which the most critical was financial resources.

The inadequacy of resources notwithstanding, this study found that an SME firm typically adjusted its operations and created process efficiencies so to assert itself in the market place. This assertion in the market place confirmed the SCP paradigm (Conner, 1991). SMEs being often non-dominant players are compelled to adapt to the external environment rather than dictate new changes. These changes subsequently allowed the firms to sustain their survival. The study demonstrated that there was a consistent conscious application of logic to every decision that was made for a firm to be innovative. Consistent with SCP, shifts in customer behaviour, in turn affected the market structure and conduct, inducing a firm's possible reaction to such consequences (Casidy et al., 2019). This study adds to the portfolio of evidence that has been adduced to the behaviour of SMEs innovation with respect to the SCP paradigm of the Industrial Organisation Theory as a result of its reaction to the environment.

On the basis of the reviewed literature, the study concluded that commercialisation and exploitation innovation, to which many SMEs resort to, was largely a demonstration of the Diffusion of Innovation Theory. However, because of the limitations of the research design used, it was not possible to empirically validate this theory. This is an area that has a future research potential with studies that suitable designed.

The study established that existing institutions influenced external circumstances which included culture, regulatory aspects and commonness of the firms. This was consistent with the neo-classical school of ITO posited that an internal choice by an entity is a function of either regulatory, normative or cultural acceptance (Scott, 2008; Berthod, 2017).

The study adopted realism philosophical approach. Though uncommon, the research design was both deductive and inductive in nature. A big challenge with realist approach is that there is no unanimity of agreement on the methodology (Marchal et al., 2012; Manzano, 2016) and coupled with the complexity around SME information requirements triggered concerns around validity and reliability of findings. Furthermore, a recommendation is that future studies consider adoption of pragmatism philosophy.

7.4.2 Contribution to Knowledge

The study provides an impetus to earlier research that argued that firm innovativeness is a function of both internal and external factors. Upon the achievement of the objectives of the study, it seeks to extend knowledge in several ways. Firstly, the study demonstrated the importance of case studies in social sciences. It is apparent that there are glaring gaps in the conceptualisation of SME Innovation. It is also observed that due to the complexity of information requirements in SMEs, a research that allows insightful generation of information is necessary (Saldar, Gilman, Raby, & Gkikas, 2020).

To have adequate information for conceptualisation and appropriate contextualisation, a study of this nature requires detailed insights from individual firm entrepreneurs. *Ipso facto*, it is imperative that the study techniques involve respondent interviews and where possible some detailed case studies. Such a need is best taken care of by case studies that allow theory extension (Yin, 2009).

The need for commercialization of innovation was emphasised. The study observed that SMEs are not enthusiastic about intellectual protection of innovations and subsequently their commercialisation. There is a need for additional research on commercialisation of innovations so as to understand the factors affecting them. This calls for applied research in the less developed countries in much as much of it is presently happening in the developed countries.

Even though it has been argued in the study that the study variables affect firm innovativeness albeit in different ways, it has also been identified in previous research that there is a high mortality rate within SMEs. It is therefore correct to assume that contributors to SMEs are circumstantially different. There is a need to test causal relationship to confirm this which would require future longitudinal studies as well as more commonly designed qualitative studies.

An analysis of the findings indicated that the level of variance of the phenomena was high. Moreover, the study models yielded fairly weak variability measures (R^2), and which were in all cases less than 20%. The implication of this observation is that there are additional variables that may not have been considered in the study. The study findings suggested that over and above the sub-variables of autonomy, proactiveness, risk taking and competitor aggression, there were other variables that could possibly affect innovativeness within manufacturing SMEs. This is indicative of a need for more exploratory studies that would allow further theorisation. This finding aligns itself to the discourse by George and Marino (2011), Andersen et al., (2015) and Wales (2016). This is an area that could be studied further, possibly by dissecting the samples by sizes or even by consideration of reflective models. The study recommends that future research should encompass a simultaneous examination of several geographies using the same set of instruments in a bid to address the same set of factors.

7.4.3 Recommendations for Practice

The study shows that there was a strong correlation between internal and external factors and firm innovativeness. Firms therefore, needed to have internal practices that would stimulate technological capability, thereby spurring innovativeness in their respective firms. Firms also needed to be aware of the environmental dynamism and continuously survey the environmental landscape so as to take appropriate action.

The study further emphasized the importance for SMEs to understand and evaluate their disposition in so far as strategies for innovation are concerned. The firms must, out of necessity, identify those capabilities that must be nurtured internally or grown in conjunction with external parties. The firms must similarly identify their reaction to the various external dynamics that will ultimately affect the market place.

In spite of all these relationships being academically proven, there is a seeming disconnect between the practitioners and academia. The study demonstrated the importance of engagement between the two. Understandably, SMEs will probably feel intimidated by having to individually work with large public research bodies or larger private firms, but the best available option is their formation into multi-firm associations and alliances. As was demonstrated by Gudda et al., (2013), co-opetition has seen firms generate higher levels of innovativeness.

Firms need to explore their internal capabilities vis-à-vis the requirements of their potential customers and more so the wider market potential. They need to ensure the level of skills and expertise available within the firm, as well as the optimum amount of resources desired for the firm resonate with the desired level of innovativeness.

SME firms need to reconsider the prioritisation of investment on automation in their firms. Based on a Tanzanian study, Kindiki (2009) concluded that much of the investment in technology was primarily focused on the basic technology for lower-end apparel subcontracting. There were opportunity costs that were lost in other areas that could possibly be automated. Efficiencies have been noted in areas where automation has been attained across various operations of the firms (Cornel University, INSEAD and WIPO, 2016; Global Entrepreneurship Monitor, 2016).

7.4.4 Recommendations for Policy

A major weakness of our previous policies has been adoption from developed countries or on the basis of generalised assumptions. As argued previously, SME information needs are complex and their interpretation is hardly easier. Whereas there have been a lot of institutional policy changes and mainly from the regulatory point of view, their focus has been on the individual firms without due regard to the possible synergistic effect. It is advisable for policy makers to have unambiguous yet focused approaches as the one-size-fits-all approach hardly achieves the desired results Martinez-Roman (2017). This study opines that to be effective, a twin-pronged approach would be required. The strategy would be directed firstly at the firms and secondly at the available ecosystem institutions.

Poignantly, overall formal lending to the manufacturing firms in 2017 was less than 1% of the number of loan accounts and less than 13% in value (Central Bank of Kenya, 2018; CBK, KNBS, & FSD Kenya, 2019). This situation would certainly encourage imports rather than production of goods, bearing in mind, according to the Central Bank of Kenya (2108), the residual balance of formal lending goes to non-manufacturing sectors. Policy interventions to address this mismatch are recommended. Interventions should similarly target the disadvantaged groups such as women and youth. This is because licensing and capital requirements for manufacturing firms are likely to require dedicated funding streams, which are not readily at the disposal of those disadvantaged.

An easier way of facilitation of cross firm engagements is through the involvement of multiple firms. Inter-company alliances, cooperative and strategic industry associations should be encouraged. A study by Bougrain and Haudeville, (2002) stated that firms firstly need to develop their own internal capabilities before seeking external cooperation.

The government should nevertheless facilitate this by aiding and encouraging the formation of the inter-firm alliances and strategic associations. This strategy was found to be effective in Croatia by Radas and Bozic (2017). Through these, various interventions can be pursued. The Micro and Small Enterprises Act, 2002 was enacted, but its core focus has been the lower tier of the sector and having a formed a quasi-government authority, retains the hallmark bureaucratic limitations of such bodies.

The medium enterprise segment, as defined in this study, is not covered by the Act and is, therefore, assumed to be under the wider jurisdiction of the legal framework that affects larger corporations. This study argues that due to the financial capital requirements, many surviving firms in the manufacturing industry will find themselves above the small enterprises threshold. This suggests a consistency with the term, *"The Missing Middle"* that is colloquially used to describe such firms. On the other hand, the Kenya Association of Manufacturers (KAM) is a members' organisation, whose core activities are predominantly for the subscribers. There is a need for extensive institutional reforms that will, among other things, broaden the scope KAM's activities as well as other similar related organisations.

As was argued by Braga and Braga (2013) and Prihadyanti (2013), making the appropriate decisions is very important for SME innovativeness. Rather than allowing SMEs to be stuck in their *enclaves*, by way of policy, they should be encouraged to embrace and adopt objective changes. This could be by way of business education training. Indeed, Croatia, Radas and Bozic, (2017) established that polices that were in place to encourage business reorganisation and these were executed through offering training that allowed firms to be informed about possible organisational and corporate structures, trends and strategies. In a study on Kenyan SMEs, Okeyo et al., (2014) confirmed that business development education was vital to the performance of SMEs.

Capacity enhancement by consultation is another route that can enable changes in SMEs. Unfortunately, such activities are viewed as expensive by SMEs, as a result of which they hardly engage professional consultants for value-add services. This can be done through subsidised consulting programmes run with the primary intention of helping them to determine the right strategy and implement the necessary changes.

Manufacturing SMEs should be encouraged to not only produce for local markets, but also as exporters. With the current globalisation efforts and the signing of the African Continental Free Trade Agreement (GOK, 2015; AfDB, 2018), SMEs need to look beyond their traditional markets (KAM, 2019). Specifically, conscientious efforts are needed to address the hurdles that limit exports to non-traditional markets, and target incentives to address these challenges. Wider markets would spur innovativeness, as entrepreneurs would be compelled to generate additional products, simplify processes as well as invest in value addition systems and technology. For this to be successful, a series of well-thought-out and executed institutional reforms will be vital. Previously, there have been a series of institutional measures to address these issues like the GOK (2005), GOK (2013) and lately GOK (2015), but these have for a long time been largely ineffective (AfDB, 2018; KAM, 2019).

Guidelines should be issued that encourage the engagement of highly qualified and well-trained staff in SMEs. Employing educated people has the potential to spur the industry-academia linkages. Educated employees will have the advantage of having social networks that cut across the various strata. Moreover, Massa and Testa (2008) argued that entrepreneurs prefer collaborating with those that they consider as peers or within their social networks.

There is a low attraction to intellectual property protection and subsequent commercialisation of innovation. The process around intellectual property protection and subsequent commercialisation of innovation should be demystified. Government programmes and specifically the National Innovation Policy that support such innovation and its commercialisation within SMEs should be simplified and made enterprise friendly. Arnold and Thuriaux (1997), Voeten (2015) and Pustovrh et al., (2017) have argued that more government funding across the world has been allocated for innovation rather than its subsequent diffusion and this has in itself dismembered the process. There is, therefore, a need for innovation ecosystems that could include industrial parks to be encouraged, thereby accelerating diffusion. Bearing in mind that most of the finances utilised for innovation are internally generated, this study opines that there is a need to establish an external pool of funds that are available and dedicated to not only the innovation but also the diffusion process.

7.5 Limitations of Study and Future Research Directions

It has been previously observed that information requirements on SME studies tend to be problematic (Ayyagan et al., 2007). This study faced similar challenges. Most SME entrepreneurs were fairly reclusive on releasing information that was specific to the firm. Inasmuch as there was a field questionnaire survey and accompanying case research, a significant effort was made in getting the entrepreneurs to feel confident to divulge such details. The study had a mix of methods and measures to determine some of the indicators. It is, therefore recommended that future studies should not be solely single approach, but rather adopt mixed method approach.

This study had a mixed method approach that allowed for the triangulation of the findings. Appropriate steps should, nevertheless, be taken against interpretation bias for the narrative analysis when designing the case studies as qualitative research analysis is an area in which there is little convergence in the approach (Sekaran & Bougie, 2013; Blumberg et al, 2014). Where possible, in case studies, more than one respondent per case and multiple sources of evidences should be obtained.

Survival bias in studies of SMEs are very prevalent (Rauch et.al, 2009; Kraus et.al.,2010). This was observed in the study, as there were numerous instances, whereby some names that were initially on the sample design, had to be struck out because by the time the research assistant contacted the sample firm, it had either changed their line of business or gone out of business altogether. Due to their mortality levels, studies on SMEs are also quite vulnerable to survivor bias and with unavailability of data on the firms that survived, there was a constraint in generalisation of the findings. Some scholars have argued that failure of SMEs in the early stage of their life, has to do with poor innovation (Musawa & Ahmad, 2018). The study could not obtain the benefit of these firm's experience in study, and confirm or reject such views.

The study design was also cross-sectional in nature and as such could not explore causal relationships. This is more so in instances of exploitative innovation. which are quite prevalent in SMEs due to their limited level of investment. A longitudinal study that studies causalities would be appropriate.

Due to the complexity of the information required and the spread of the sample respondents, this study may have been affected by a common method variance and in some wherein the opinions of the respondents may have been influenced by the respondent biases over time. The study may also have been affected by non-response bias whereby the respondents did not answer to specific questions within the instrument. Even though social science research is prone to such errors, this is an area that future studies should mitigate against.

Further areas of research include establishing whether there is a relationship between the age of a firm and level of innovativeness in manufacturing firms. Is it true, for instance, that for one to be succeed in manufacturing, one needs to be a middle-aged man? What is the relationship between the level of financial investment and innovativeness? What is the relationship between gender and manufacturing bearing in mind that this is a capital-intensive business? What is the appropriate philosophical approach on studies whose information requirements are fragmented and complex like SMEs?

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APPENDICES

Appendix I: Research Questionnaire

Dear Respondent,

The purpose of this questionnaire is to collect data on a study on *Entrepreneurial Orientation, Technological Capability, Environmental Dynamism and Firm Innovativeness within Manufacturing SMEs in Nairobi County*. Manufacturing firms are considered as those firms, which engage in physical activities that add value to a product or raw material. The scope of this study is also limited to those firms that have annualised sales turnover that is between five hundred thousand and one billion Kenya shillings per annum. The information is purely for academic reasons and will be treated in strict confidence. Please answer the questions as completely as you can. Your participation in this exercise is really appreciated.

SECTION A: GENERAL INFORMATION

1. Name of Organisation (Optional)………………………………………………...
2. Year of Establishment of Business……………………………………………….
3. Name of Respondent (Optional)…………………………………………………
4. Position held in Organisation…………………………………………….....……
5. Are you an Owner or Employee in the Organisation…………………………….

6. What is the age of the principle owner of the firm? Tick as appropriate..
    a. Between 18-30 ( )
    b. Between 30-45 ( )
    c. Above 45 years ( )

7. What is the gender of the principle owner of the firm? Tick as appropriate
    a. Male ( )
    b. Female ( )

8. How many staff do you have in your firm on a regular basis (Tick as appropriate)
    a. Below 10 ( )
    b. 10-49 ( )
    c. 50-99 ( )
    d. Above 100 ( )

9. What is the nature of your business (Tick as appropriate)
   a. Manufacturing of wearing apparel ( )
   b. Manufacture of fabricated metal products ( )
   c. Manufacture of food products ( )
   d. Manufacture of wood and products of wood and cork ( )
   e. Manufacture of furniture ( )
   f. Manufacture of chemical and chemical products ( )
   g. Others (please specify)…………………………………
10. What is your estimated annual sales of the firm for the past year? ………………..
11. In percentage terms, what was the set aside budget for creativity and innovation in the firm in the past year?....................
12. What has been the main source of finances for your innovation?
   a. Own funds.................................. b. Loans…………………………..
   c. External partnerships.................. d. Other sources………………….

   ***Please specify source and give summary of terms*.**
13. Is the business model for the firm the same as when the founder started it?

    ....
14. What would you say have been the driving reasons for innovation in the business?

    ………………...
15. What have been the challenges to innovation?..........................……………….. ………
16. Who proposes in the firm changes to the processes and products?...........................
17. From the inception of the firm, have you ever revised any processes or improved the product range?..
18. Do you patent, register or trademark your products/services and system changes with KIPI[1], WIPO[2] or ARIPO[3] in your firm………………………………………
19. If not, why……………………………………………………………………

Notes:

1. KIPI – Kenya Industrial Property Institute
2. WIPO – World Industrial Property Organisation
3. ARIPO – African Regional Intellectual Property Organisation

SECTION B: ENTREPRENEURIAL ORIENTATION

Entrepreneurial orientation is studied as the first variable affecting the outcome. For purposes of this study, it is explained as that process or habits that encourage an entity to behave in an entrepreneurial manner. Please indicate the extent to which the following statements describe your firm's behaviour over the past five years. Please indicate by ticking (√) on the most applicable answer:

Key: 1= Strongly Disagree 3= Neither Agree nor disagree 5= Strongly Agree

	Statement	**1**	**2**	**3**	**4**	**5**
1.	**Autonomy**					
i.	Our firm supports the efforts of individuals that work autonomously					
ii.	Our firm requires individuals to rely on Senior managers to guide their work					
iii.	In general, the top managers of our firm believe that the best results occur when individuals decide for themselves what business opportunities to pursue					
iv.	In the firm the top managers of our firm believe that the best results occur when the CEO and top managers provide the primary impetus for pursuing business opportunities					
v.	In our firm, individuals pursuing business opportunities make decisions on their own without constantly referring to their supervisor					
vi.	In our firm, individuals pursuing business opportunities are expected to obtain approvals from their supervisors before making decisions					
vii.	In our firm, the CEO and the top management team play a major role in identifying and selecting the entrepreneurial opportunities the firm pursues					
viii.	In our firm, employee initiatives and input play a major role in identifying and selecting the entrepreneurial opportunities the firm pursues.					
2.	**Proactiveness**					
i.	In general, the top managers of our firm have a strong tendency to be ahead of others in introducing novel ideas or products.					

ii.	In general, the top managers of our firm favour an emphasis on the marketing of tried and tested products or services					
iii.	In dealing with competitors, our firm typically initiates actions which competitors then respond to.					
iv.	Our firm typically responds to actions which competitors initiate					
v.	In dealing with competitors, our firm is very often the first business to introduce new products/services, administrative techniques, operating technologies, etc					
vi.	Our firm is very seldom the first business to introduce new products/services, administrative techniques, operating technology etc etc					
vii.	Our company is the first to detect fundamental shifts in our industry (e.g., competition, technology, regulation).					
3.	**Risk Taking**					
i.	Our firm has a strong tendency for lower risk projects (with normal and certain rates of return)					
ii.	Our firm has a strong proclivity for high risk projects (with chances of very high returns)					
iii.	Owing to the nature of the environment, our firm finds it best to explore it gradually via timid, incremental behaviour					
iv.	Owing to the nature of the environment, bold, wide-ranging acts are necessary to achieve the firm's objectives.					
v.	Our firm typically adopts a cautious, 'wait and see" posture in order to minimise the probability of making costly decisions.					
vi.	When confronted with decisions involving uncertainty, our firm typically adopts a bold posture in order to maximise the probability of exploiting opportunities.					
4.	**Competitor Aggression**					
i.	Our firm typically adopts a very competitive "undo-the-competitors" posture					
ii.	Our firm is very aggressive and intensely competitive.					
iii.	Our firm typically seeks to avoid competitive clashes, preferring a "live" and "let-live" posture					

SECTION C: TECHNOLOGICAL CAPABILITY

Another key concept on this study is technological capability which is considered to be that internal state of readiness to accept or develop innovation. It includes tangible and intangible assets. Please indicate the extent to which the following statements describe your firm's behaviour over the past five years. Please indicate by ticking (√) on the most applicable answer:

Key: 1= Strongly Disagree 3= Neither Agree nor disagree 5= Strongly Agree

	Statement	**1**	**2**	**3**	**4**	**5**
1.	**Research Budgetary Allocation**	Cross Reference to Question A: 11-13				
2.	**Existing Patents and Licences**	Cross Reference to Question A: 14-18				
3.	**Positive Organisational Phenomena**					
i.	We recruit staff, who are academically and technically qualified, strong in originality and are self-starters in their respective assignments					
ii.	Our business plans are driven more by technological advances than by market research					
iii.	Our company does a lot of in-house market research.					
iv.	Our company is slow to detect changes in our customers' product/ service preferences.					
v.	Our company frequently meets our customers to fine tune our marketing practices and keep up with the market and competitors.					
vi.	The nature of innovation in the firm is mostly new innovation that has been untested elsewhere					
vii.	The nature of innovation in the firm is adapted from other firm's practices or products					
viii.	Our company rarely meets with our customers to evaluate our marketing practices and understand the market and competitors					
ix.	We incorporate and measure our input of our existing patents in the newly designed products					
x.	Our processes and service standards are designed such that they are a development over the previous standards					

SECTION D: ENVIRONMENTAL DYNAMISM

A final dependable that is being studied is environmental dynamism which relates to the change that occurs to the external circumstances under which a firm operates. Please indicate the extent to which the following statements describe your firm's behaviour over the past three years. Please indicate by ticking (√) on the most applicable answer:

Key: 1= Strongly Disagree 3= Neither Agree nor disagree 5= Strongly Agree

	Statement	1	2	3	4	5
1.	**Socio-Cultural**					
i.	Our firm favours diversity in ethnic, religious and cultural backgounds and encourages sharing of diverse opinions in its business development.					
ii.	Our firm does not consider ethnical, religious nor cultural background as being important in business development.					
iii.	The demands and tastes of our consumers are very easy to predict and forecast.					
iv.	The demands and tastes of our customers are very varied and are seldom easy to predict					
2.	**Regulatory Framework**					
i.	Our company has little interaction with the industry regulators and legislators to understand and advocate on some of the impeding and enacted legislation and policy changes that could affect our industry.					
ii.	Our company has frequent interaction with the industry regulators and legislators to understand and advocate for some of the impending and enacted legislation and policy changes					
3.	**Linkages/Alliances & Partnerships**					
i.	The organisation regularly enters into mutually beneficial networks/ alliances/partnerships, whose sole mandate is driving innovation in the industry					
ii.	We collect industry information by informal means (e.g., lunch with industry friends).					
iii.	The organisation rarely participates in larger private firm-research-driven initiatives					
iv.	The organisation participates in larger private firm-research-driven initiatives at least once every six months (semi-annually)					
v.	The organisation rarely participates in public-research-driven initiatives					
vi.	The organisation participates in public-research driven initiatives at least once every quarter.					

4.	**Available Industry Practices**					
i.	The production/service technology is not subject to very much change and is well established;					
ii.	The modes of production/service change often and in a major way.					
iii.	The rate at which products/services are getting obsolete in the industry is very slow.					
iv.	The rate of obsolescence is very high in our industry.					
v.	In our market, the volumes of products and services to be delivered change fast and often.					
vi.	In a year, nothing has changed in our market in terms of the demand of products and services.					

SECTION E: FIRM INNOVATIVENESS

Firm Innovativeness is studied as the outcome variable and is considered to be the process that allows entities to adopt innovation. The innovation may be measured in products, registered patents, service or process or external interest. Please indicate by ticking (√) on the most closest comment that is applicable to your firm.

	1	**2**	**3**	**4**	**5**	
In my firm, there exists a very strong emphasis on marketing of tried and true product/ services from the industry						In my firm, there exists a very strong emphasis on R&D, technological leadership, and innovations
In my firm, no new lines of products, services, or programs were introduced during the past three years						In my firm, more than half of our product lines or services were introduced during the past three years
In my firm, changes in product lines have been minor over the last three years						In my firm, changes in product lines have been major over the last three years

Please indicate the total number over the past twelve months in your firm;-

	Measure	**Number of New in the past 1 year**
1.	Number of new products developed	
2.	Number of new processes developed	
3.	Number of new system changes adopted	
5.	Please indicate the proportion of funds as compared to the firm's total expenditure that you have set aside for innovation (indicate in %)	Please tick as appropriate 0-5%................................. 5-20%................................ Greater than 20%................
6.	Please indicate the value of interest or capital that has been generated as a result of creative and innovative activities in the organization (Please tick)	
	No interest	
	Interest but no Capital generated	
	Interest and Venture Capital generation	Indicate Value

Would you like to get a complimentary copy of this study? Yes/No………………

If Yes, please indicate contact Email Address/Telephone Number…………………….

………………………………………………………………………………………..

THANK YOU FOR PARTICIPATING IN THE STUDY

Appendix II: Reference Codes on Questions Asked

ENTREPRENEURIAL ORIENTATION	
AUTONOMY	
EOA1	Our firm supports the efforts of individuals that work autonomously.
EOA2	Our firm requires individuals to rely on senior managers to guide their work.
EOA3	In general, the top managers of our firm believe that the best results occur when individuals decide for themselves what business opportunities to pursue.
EOA4	In the firm the top managers of our firm believe that the best results occur when the CEO and top managers provide the primary impetus for pursuing business opportunities.
EOA5	In our firm, individuals pursuing business opportunities make decisions on their own without constantly referring to their supervisor.
EOA6	In our firm, individuals pursuing business opportunities are expected to obtain approvals from their supervisors before making decisions.
EOA7	In our firm, the CEO and the top management team play a major role in identifying and selecting the entrepreneurial opportunities the firm pursues.
EOA8	In our firm, employee initiatives and input play a major role in identifying and selecting the entrepreneurial opportunities the firm pursues.
PROACTIVENESS	
EOP1	In general, the top managers of our firm have a strong tendency to be ahead of others in introducing novel ideas or products.
EOP2	In general, the top managers of our firm favour an emphasis on the marketing of tried and tested products or services.
EOP3	In dealing with competitors, our firm typically initiates actions which competitors then respond to.
EOP4	Our firm typically responds to actions which competitors initiates.
EOP5	In dealing with competitors, our firm is very often the first business to introduce new products/services, administrative techniques, operating technologies, etc
EOP6	Our firm is very seldom the first business to introduce new products/services, administrative techniques, operating technology etc
EOP7	Our company is the first to detect fundamental shifts in our industry (e.g., competition, technology, regulation).
RISK TAKING	
EORT1	Our firm has a strong tendency for lower risk projects (with normal and certain rates of return).

EORT2	Our firm has a strong proclivity for high risk projects (with chances of very high returns).
EORT3	Owing to the nature of the environment, our firm finds it best to explore it gradually via timid, incremental behaviour.
EORT4	Owing to the nature of the environment, bold, wide-ranging acts are necessary to achieve the firm's objectives.
EORT5	Our firm typically adopts a cautious, 'wait and see' posture in order to minimise the probability of making costly decisions.
EORT6	When confronted with decisions involving uncertainty, our firm typically adopts a bold posture in order to maximise the probability of exploiting opportunities.
COMPETITOR AGGRESSION	
EOCA1	Our firm typically adopts a very competitive "undo-the-competitors" posture
EOCA2	Our firm is very aggressive and intensely competitive.
EOCA3	Our firm typically seeks to avoid competitive clashes, preferring a "live" and "let-live" posture

TECHNOLOGICAL CAPABILITY	
POSITIVE ORGANISATIONAL PHENOMENON	
TCPOP1	We recruit staff who are academically and technically qualified, strong in originality and are self starters in their respective assignments
TCPOP2	Our business plans are driven more by technological advances than by market research.
TCPOP3	Our company does a lot of in-house market research.
TCPOP4	Our company is slow to detect changes in our customers' product/ service preferences.
TCPOP5	Our company frequently meets our customers to fine tune our marketing practices and keep up with the market and competitors.
TCPOP6	The nature of innovation in the firm is mostly new innovation that has been untested elsewhere
TCPOP7	The nature of innovation in the firm is adapted from other firm's practices or products.
TCPOP8	Our company rarely meets with our customers to evaluate our marketing practices and understand the market and competitors.
TCPOP9	We incorporate and measure our input of our existing patents in the newly designed products.
TCPOP10	Our processes and service standards are designed such that they are a development over the previous standards.

ENVIRONMENTAL DYNAMISM	
SOCIO-CULTURAL	
EDSC1	Our firm favours diversity in ethnic, religious and cultural backgounds and encourages sharing of diverse opinions in its business development.
EDSC2	Our firm does not consider ethnical, religious nor cultural background as being important in business development.
EDSC3	The demands and tastes of our consumers are very easy to predict and forecast.
EDSC4	The demands and tastes of our customers are very varied and are seldom easy to predict
REGULATORY FRAMEWORK	
EDRF1	Our company has little interaction with the industry regulators and legislators to understand and advocate on some of the impending and enacted legislation and policy changes that could affect our industry.
EDRF2	Our company has frequent interaction with the industry regulators and legislators to understand and advocate for some of the impending and enacted legislation and policy changes.
LINKAGES/ALLIANCES AND PARTNERSHIPS	
EDLAP1	The organisation regularly enters into mutually beneficial networks/ alliances/ partnerships whose sole mandate is driving innovation in the industry.
EDLAP2	We collect industry information by informal means (e.g., lunch with industry friends).
EDLAP3	The organisation rarely participates in larger private firm-research driven initiatives.
EDLAP4	The organisation participates in larger private firm-research driven initiatives at least once every six months (semi-annually)
EDLAP5	The organisation rarely participates in public-research-driven initiatives
EDLAP6	The organisation participates in public-research-driven initiatives at least once every quarter.
AVAILABLE INDUSTRY/ PRACTICES	
EDAIP1	The production/service technology is not subject to very much change and is well established.
EDAIP2	The modes of production/service change often and in a major way
EDAIP3	The rate at which products/services are getting obsolete in the industry is very slow.
EDAIP4	The rate of obsolescence is very high in our industry.
EDAIP5	In our market, the volumes of products and services to be delivered change fast and often.
EDAIP6	In a year, nothing has changed in our market in terms of the demand of products and services.

FIRM INNOVATIVENESS	
FI1	In my firm, there exists a very strong emphasis on marketing of tried and true products/ services from the industry.
FI2	In my firm, no new lines of products, services, or programmes were introduced during the past three years.
FI3	In my firm, changes in product lines have been minor over the last three years

Appendix III: Interview Guide

- The purpose of this Interview Guide is to collect qualitative data on a study on entrepreneurial orientation, technological capability, environmental dynamism and innovativeness within manufacturing SMEs in Nairobi County. **This is for select cases only.**
- **The interviewee has to be the firm owner or entrepreneur**. Interviewer to elaborate and prod the interviewee where possible. Assure the interviewee that the information is purely for academic reasons and will be treated in strict confidence.

Prompts

- Name of Organisation
- Name and Age of Respondent
- Year of Establishment of Business
- Nature of your business? (Observe)
- Professional line of experience in this business?
- Establish if, respondent has any formal training in this type of business?
- Establish staffing levels in firm
- Establish own/staff level of engagement/involvement in the innovation in the business.
- Establish the motivation for starting the business
- Obtain confirmation on whether the firm has been innovative and reasons thereof.
- Establish the driving reasons for innovation in the business
- Establish the other external partners in business
- Identify the challenges to innovation
- Identify the competitors to the business
- Discuss the financial budgets, sources and resource outlay allocated to innovation.
- What is the set aside budget for creativity and innovation in the firm?
- Establish the firms' interaction and experience with the IPR bodies eg KIPI.
- Identify the owner's biggest regrets in business and what they would do differently if they had a second chance?

Appendix IV: Intellectual Property Rights Data from Kenya Industrial Property Institute

Table 0.1: Applications of Patents, Trade Marks, Industrial Designs and Utility Model Statistics (2002-2008)

A1: Number of Patent Applications (Including applications designating Kenya filed through and granted by ARIPO)																			
Year	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
Residents	**23**	**16**	**23**	**22**	**31**	**34**	**41**	**41**	**63**	**48**	**77**	**135**	**123**	**127**	**132**	**139**	**144**	**135**	**244**
Non-residents	0	1	3	3	3	6	2	6	0	6	2	1	8	2	1	4	3	5	4
PCT National Phase by non-residents	28	44	46	70	50	53	39	85	89	117	118	121	128	111	75	53	55	38	38
Total national	51	61	72	95	84	93	82	132	152	171	197	257	259	240	208	196	202	178	286
ARIPO - designating Kenya	276	345	295	217	226	253	350	380	381	301	354	444	516	575	668	656	544	612	628
Grand Total	**327**	**406**	**367**	**312**	**310**	**346**	**432**	**512**	**533**	**472**	**551**	**701**	**775**	**815**	**876**	**852**	**746**	**790**	**914**
B1: Number of Trade Mark Applications (including Marks Applied and registered through the Madrid System (https://bit.ly/1mOynZ0)administeredbyWIPO)																			
Year	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
Residents	621	771	810	750	778	1017	1228	1428	1372	1675	2031	2501	2329	2787	3224	3432	3573	3675	3654
Non-Residents	1234	945	1014	705	618	696	691	752	753	778	895	1031	1253	1182	1360	1261	1270	1349	1212
Total National	**1855**	**1716**	**1824**	**1455**	**1396**	**1713**	**1919**	**2180**	**2125**	**2453**	**2926**	**3532**	**3582**	**3969**	**4584**	**4693**	**4843**	**5024**	**4866**
Madrid designations	1399	1222	1019	1100	1326	1336	1360	1429	1411	1368	1427	1546	1677	1652	1746	1720	1909	1803	2008
Grand total	**3253**	**2938**	**2843**	**2552**	**2721**	**3047**	**3278**	**3609**	**3557**	**3835**	**4350**	**5075**	**5254**	**5615**	**6317**	**6405**	**6744**	**6819**	**6874**
C1: Number of Industrial Design Applications (Including Design applications designating Kenya filed through and Registered by ARIPO)																			
Year	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
Residents			**73**	**43**	**44**	**102**	**54**	**42**	**39**	**76**	**69**	**86**	**93**	**78**	**78**	**73**	**89**	**141**	**170**
Non-Residents			12	10	11	15	18	32	10	14	7	28	10	8	17	12	15	7	7
Total National			85	53	55	117	72	74	49	90	76	114	103	86	95	85	104	148	177
ARIPO - designating Kenya	9	7	4	13	8	11	19	35	9	21	17	38	118	165	53	97	50	61	81
Grand Total			**89**	**66**	**63**	**128**	**91**	**109**	**58**	**111**	**93**	**152**	**221**	**251**	**148**	**182**	**154**	**209**	**258**
D1: Number of Utility Model Applications (Including Utility Models Registered by ARIPO on behalf of Kenya)																			
Year			**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
Residents			**14**	**12**	**13**	**11**	**19**	**16**	**18**	**29**	**28**	**51**	**68**	**78**	**83**	**114**	**135**	**152**	**177**
Non-residents			0	0	0	0	0	0	1	1	0	0	0	0	0	1	0	1	1
Total National			14	12	13	11	19	16	19	30	28	51	68	78	83	115	135	153	178
ARIPO designating Kenya			**0**	**1**	**1**	**0**	**0**	**1**	**0**	**0**	**0**	**1**	**2**	**3**	**4**	**3**	**5**	**4**	**20**
Grand Total			**14**	**13**	**14**	**11**	**19**	**17**	**19**	**30**	**28**	**52**	**70**	**81**	**87**	**118**	**140**	**157**	**198**

Table 0.2: Approved Patents, Trade Marks, Industrial Designs, Utility Model Statistics (2002-2008)

A2: Number of Patents Granted (Including applications designating Kenya filed through and granted by ARIPO)																			
Year	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
Residents	**0**	**4**	**0**	**6**	**8**	**8**	**5**	**4**	**5**	**6**	**4**	**4**	**4**	**2**	**4**	**1**	**4**	**11**	**10**
Non-Residents	4	0	0	2	0	24	6	1	4	5	3	0	0	0	0	0	0	0	1
PCT National Phase (Non-residents)	14	11	7	12	7	16	18	12	33	76	47	55	72	69	49	23	20	31	15
B2 Number of Trade Marks Registered (including Marks Applied and registered through the Madrid System(https://bit.ly/1mOynZ0)administeredbyWIPO)																			
Year		**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
Residents		390	271	333	719	1967	1305	1073	1211	1159	1360	1586	1924	1883	2123	2350	2781	2783	2624
Non-Residents		913	431	672	1253	3665	1410	829	901	840	992	1002	1031	1175	1036	1142	1047	1144	1007
Total National		**1303**	**702**	**1005**	**1972**	**5632**	**2715**	**1902**	**2112**	**1999**	**2352**	**2588**	**2955**	**3058**	**3159**	**3492**	**3828**	**3927**	**3631**
Madrid designations		1222	1019	1097	1325	1334	1359	1429	1432	1382	1424	1543	1672	1646	1733	1712	1900	1778	1700
Grand total		**2525**	**1721**	**2102**	**3297**	**6966**	**4074**	**3331**	**3544**	**3381**	**3776**	**4131**	**4627**	**4704**	**4892**	**5204**	**5728**	**5705**	**5331**
C2: Number of Industrial Designs Registered (Including Design applications designating Kenya filed through and Registered by ARIPO)																			
Year	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
Residents			**1**	**8**	**5**	**59**	**34**	**16**	**33**	**90**	**39**	**31**	**38**	**30**	**31**	**52**	**37**	**60**	**122**
Non-Residents			0	8	0	7	13	19	15	13	11	9	12	8	3	5	15	12	13
Total National			1	16	5	66	47	35	48	103	50	40	50	38	34	57	52	72	135
Registrations through ARIPO	10	4	9	5	10	8	7	10	24	32	21	27	33	107	213	83	111	43	51
Grand Total			**10**	**21**	**15**	**74**	**54**	**45**	**72**	**135**	**71**	**67**	**83**	**145**	**247**	**140**	**163**	**115**	**186**
D2: Number of Utility Models Registered (Including Utility Models Registered by ARIPO on behalf of Kenya)																			
Year			**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
Residents			**0**	**1**	**1**	**8**	**4**	**2**	**3**	**2**	**5**	**1**	**1**	**4**	**31**	**22**	**22**	**79**	**32**
Non-Residents			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total national			0	1	1	8	4	2	3	2	5	1	1	4	31	22	22	79	17832 178
Registrations through ARIPO			**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**3**	**0**	**6**	**1**
Grand total			**1**	**1**	**1**	**8**	**4**	**2**	**3**	**2**	**5**	**1**	**1**	**4**	**31**	**25**	**22**	**85**	**33**

Appendix V: Letter of Introduction from the University

UNIVERSITY OF NAIROBI
COLLEGE OF HUMANITIES & SOCIAL SCIENCES
SCHOOL OF BUSINESS

Telephone: 4184160-5 Ext 215
Telegrams: "Varsity"' Nairobi
Telex: 22095 Varsity

P.O. Box 30197
Nairobi, KENYA

5th December, 2017

TO WHOM IT MAY CONCERN

Dear Sir/Madam,

INTRODUCTORY LETTER FOR RESEARCH
BENDEDICT WANDERA MKALAMA– REGISTRATION NO. D80/97144/2015

The above named is a registered PhD candidate at the University of Nairobi, School of Business. He is conducting research on ***"Entrepreneurial Orientation, Technological Capability, Environmental Dynamism and Innovativeness in Small and Medium Manufacturing Enterprises in Nairobi, Kenya."***

The purpose of this letter is to kindly request you to assist and facilitate the student with necessary data which forms an integral part of the research project. The information and data required is needed for academic purposes only and will be treated in **Strict-Confidence**.

Your co-operation will be highly appreciated.

Thank you.

ASSOCIATE DEAN
Graduate Business Studies
School of Business (UON)
NAIROBI

DR. MARY KINOTI
Associate Dean, Graduate Business Studies
School Of Business

MK/nwk

Appendix VI: Letter of Authorisation from Nacosti

NATIONAL COMMISSION FOR SCIENCE, TECHNOLOGY AND INNOVATION

Telephone: 020 400 7000,
0713 788787,0735404245
Fax: +254-20-318245,318249
Email: dg@nacosti.go.ke
Website: www.nacosti.go.ke
When replying please quote

NACOSTI, Upper Kabete
Off Waiyaki Way
P.O. Box 30623-00100
NAIROBI-KENYA

Ref. No. **NACOSTI/P/18/84809/20591**

Date: **5th January, 2018**

Benedict Wandera Mkalama
University of Nairobi
P.O. Box 30197-00100
NAIROBI.

RE: RESEARCH AUTHORIZATION

Following your application for authority to carry out research on ***"Entrepreneurial orientation, technological capability, environmental dynamism and innovativeness in small and medium manufacturing enterprises in Nairobi, Kenya"*** I am pleased to inform you that you have been authorized to undertake research in **Nairobi County** for the period ending **5th January, 2019.**

You are advised to report to **the County Commissioner and the County Director of Education, Nairobi County** before embarking on the research project.

Kindly note that, as an applicant who has been licensed under the Science, Technology and Innovation Act, 2013 to conduct research in Kenya, you shall deposit **a copy** of the final research report to the Commission within **one year** of completion. The soft copy of the same should be submitted through the Online Research Information System.

BONIFACE WANYAMA.
FOR: DIRECTOR-GENERAL/CEO
Copy to:

The County Commissioner
Nairobi County.

The County Director of Education
Nairobi County.

National Commission for Science, Technology and Innovation is ISO9001:2008 Certified

Appendix VII: List of Customers Surveyed

1. A.MM Engineering Works Ltd.
2. Abadin Ltd.
3. ABC Lab Net
4. ABC-Lab Net
5. Abiola Steel and Metal Arts
6. Absolate Chocolate Ltd.
7. Accurate Steel Plus
8. Ace Chemicals
9. Ace Chemicals Ltd.
10. Admart Africa Ltd.
11. Aesthetic Ltd.
12. Afri Fashions
13. Afri Piping Systems Kenya
14. Africa International Trading Co.
15. Africa Polyrack Ltd.
16. African Cables
17. Afro Cables Industries Ltd.
18. Afro Finish Ltd.
19. Afro Truck Ltd.
20. Agba Car Sales
21. Agro Manufacturing Co. Ltd.
22. Agro Manufacturing Co. Ltd.
23. Agro-Manufacturing Co. Ltd.
24. Akam Wear Ltd.
25. Akam Wears Ltd.
26. Akams Wears Ltd.
27. Akiyda 2000 Ltd.
28. Alankar Manufacturing Ltd.
29. Allnic Faith Garments
30. Alnkar Manufacture Ltd.
31. Alo-Tech Enterprises
32. Alph Woollens
33. Alphan Woollens (K) Ltd.
34. Amems Fashions Ltd.
35. American Bottling Co. Ltd.
36. Ameriken Ltd.
37. Anderson Butchery & P.
38. Andiron Aluminium Ltd.
39. Androclori Chemical Agencies
40. Androclovi Chemical Agencies
41. Angelica Industries Ltd.
42. Anmol Ltd.
43. Antiga Furniture Ltd.
44. A-Plus PVC Technology
45. Aqua Blue Ltd.
46. Arax Mills Ltd.
47. Aray Mills Ltd.
48. Arch Furniture Ltd.
49. Arch Furnitures Ltd.
50. Argos Interiors
51. Arvees Fashions Ltd.
52. Arvi Chemicals Ltd.
53. Asterisk Solutions Ltd.
54. Astral Industries Ltd.
55. Atoz Richtech De. Furniture
56. Auto Aid Services Ltd.
57. Auto Body and Paints Ltd.
58. Auto Skill Ltd.
59. Awasi Enterprises
60. B. Smart Products Ltd.
61. Bag and Envelope Converters Ltd.
62. Bagga Engineering Works Ltd.
63. Bakers Oven Ltd.
64. Bambino Outfitters
65. Barjot Chemicals
66. Becon Ltd.
67. Beemart Laundry and Cleaning
68. Belat Enterprises
69. Best Manufacturer Ltd.
70. Beta Packing Ltd.
71. Boiler Consortium Ltd.
72. Bonafrica Investment Ltd.
73. Broman Ventures
74. Bruce Truck and Equipment (E.A.) Ltd.
75. C4R Food Industries
76. Canaan Plastics Ltd.

77. Capel Food Ingrediener Ltd.
78. Carlma Engineering Ltd.
79. Cateress Milling Co. Ltd.
80. CB Designs
81. Celmelo Agencies
82. Cementers Ltd.
83. Cera Palk Products Ltd.
84. Chalbi Industries Ltd.
85. Challage Engineering Works Ltd.
86. Chania Scrap Metals
87. Cheka Furniture
88. Chemicaland Ltd.
89. Chemid Kenya Ltd.
90. Chemsois Ltd.
91. Chic Fashions Ltd.
92. Chui Manufacturers Ltd.
93. Chui Rolling Mills
94. Chuma Strith Engineering Ltd.
95. Cianoci Ltd.
96. City Farming Ltd.
97. Confini Ltd.
98. Copperbelt Metal and General
99. Creative Joiners Ltd.
100. Creative Manufacturers Ltd.
101. Crest Millers
102. Cresto Wears
103. Crown Paints Ltd.
104. Cryman Enterprises Ltd.
105. Crystal Aluminium Works Ltd.
106. Cyclone Plastic (K) Ltd.
107. D.D. Butchery
108. Deinar Plumbing Contractors
109. Deluxe Food Industries
110. Dentex Industries Ltd.
111. Devmos Plastics
112. Diamond Woods
113. Dom Wood Furnitures
114. Donk Fraw Furnitures Land
115. Dormans Coffee Ltd.
116. Drimz Furnitures
117. Dupon Paints
118. Durable Macadamia
119. Dynamic Chemical
120. Dynamic Chemicals Ltd.
121. E. Africa Sea Food Ltd.
122. Eagle Auto Care
123. East Africa Canvas Company Ltd.
124. East Africa Steel Structures and Engineering Supplies Limited
125. Economic Industries Ltd.
126. Edgestone
127. Eleegant Sleek Products
128. Elnak Printers and Stationers
129. Elys Chemical Ind. Ltd.
130. Empire Glass Industries Ltd.
131. Euro Industrial Chemicals Ltd.
132. Euro Industrial Chemicals Ltd.
133. Everest Manufacturing Ltd.
134. Excel Packaging Ltd.
135. Faith Base Furnitures
136. Fire Wood Works Ltd.
137. Frana Enterprises
138. Fraya Enterprises
139. Gatz Macadamia Ltd.
140. Gebsta Ltd.
141. Geoly Textiles & Outfitters
142. Githinji Enterprises
143. Goldstar Feeds Ltd.
144. Grid-Tech Electricals
145. Hancy Group Ltd.
146. Harvesters Millers Ltd.
147. Hcon System
148. Hinda Aluminium Industries K. Ltd.
149. Hirleys Furniture
150. Ideas Manufacturing Co. Ltd.
151. Industrial Boilers
152. Industrial Boilers Products Ltd.
153. Infinity Plastics Ind. Ltd.
154. Jambo E.A. Ltd.
155. Jamii Posho Mill
156. Jasho Furnitures
157. Jessymax Holdings Ltd.
158. Jojo Plastic Ltd.
159. Joskind Building Materials

160. Kabs Sawminners
161. Kahore Tyres
162. Kaleispo Ltd.
163. Kargo Wear
164. Kemco Clothing Co.
165. KenAfric
166. Kenya Canvas Ltd.
167. Kevian (K) Ltd.
168. King's Worth Ventures Ent.
169. K-James Ltd.
170. Kukitech Enterprises
171. Loopifily Ltd.
172. Lumiqon Ltd.
173. M.M.A Engineering
174. Manji Foods Industries Ltd.
175. Manyatta Millers Ltd.
176. Maruon Ltd.
177. Masculino Bakers
178. Mico Paints Ltd.
179. Mimar Engineering
180. Mini Bakers (NBI) Ltd.
181. Moments Last Respects
182. Murphy Chemicals E.A. Ltd.
183. Mwananchi Clothing Factory
184. Mworoto Works Ltd.
185. N.D. Shah and Sons (Kenya) Ltd.
186. Nas Plastic Ltd.
187. Nasco Daper Industries
188. Ngingo Shoes Ltd.
189. Nobos Trading
190. Patco Industries Ltd.
191. Pearl Industries Ltd.
192. Polyster Industries Ltd.
193. Premier Flour Mills
194. Proto Energy Ltd.
195. Ramz Dez Engineering
196. Safya Waters Company
197. Sebman Enterprises
198. Servana General Agencies Ltd.
199. Servelet System Ltd.
200. Seweco Paints
201. Shamco Paints (k) Ltd.
202. Smail Industrial Plant
203. Sole Propriatership
204. South Seas Food (k) Ltd.
205. SteamTech Ltd.
206. Sunplast
207. Supa Snacks Ltd.
208. Superstar Furnitures
209. Sweety Sweets
210. Tango Industries Ltd.
211. Techjo Enterprises
212. The Hive
213. Themaco Group Ltd.
214. Thenoel Investment
215. Tim palace Kitchen Ltd.
216. Timeline Solutions
217. Top food E.A. Ltd.
218. Tri Packing Ltd.
219. Tumaini Posho Mill
220. Twiga Chemicals Industries Ltd.
221. Two Thousands Ltd.
222. Unispan Ltd.
223. United Garment Manufacturers Ltd.
224. Uwezo Paper Products
225. Vancetech Ltd.
226. Vebee Fabricators
227. Vee Manufacturing & Trading Co.
228. Victory Footware
229. Vision Industries (K) Ltd.
230. Vivo Active Wears Ltd.
231. Wamwangi Fashions Ltd.
232. Wandi Packing Ltd.
233. Wema Posho Mill
234. Yala Beverages Ltd.
235. Zapet Ltd.
236. Zenzo Furnitures
237. Zook Chemicals