

**PRODUCT DESIGN STRATEGY UTILISATION IN DETERMINING
THE PERFORMANCE OF MICRO AND SMALL TEXTILE
ENTERPRISES IN NAIROBI CITY COUNTY, KENYA**

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DECLARATION

This thesis is my original work and has not been presented for a degree in any other University.


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DEDICATION

To my daughter, Vanessa, for her unflagging moral support and encouragement.

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ABBREVIATIONS AND ACRONYMS

C	Concept
CC	Concept to new concept
CK	Concept to knowledge
CSM	Creative Stage Model
DCT	Dynamic Capability Theory
GDP	Gross Domestic Product
GLM	General Linear Model
GOK	Government of the Republic of Kenya
IToC	Investment Theory of Creativity
K	Knowledge
KC	Knowledge to concept
KK	Knowledge to new knowledge
KIPPRA	Kenya Institute for Public Policy Research and Analysis
KNBS	Kenya National Bureau of Statistics
MSEs	Micro and Small Enterprises
MCS	Monte Carlo Simulation
MSMEs	Micro, Small and Medium Enterprises
NGO	Non-Government Organisation
NPD	New Product Development
PD	Product Design
PDSN	Product Design Strategy Nexus
PLoC	Perceived Locus of Causality

RBV	Resource Based View
SDT	Self-Determination Theory
SMEs	Small and Medium Enterprises
SPSS	Statistical Package for the Social Sciences
STI	Science, Technology and Innovation
TPD	Textile Product Design
UNIANOVA	Univariate Analysis of Variance

OPERATIONAL DEFINITION OF TERMS

The following terms have been used and their operational definitions in this study are as follows:

- Choice of Change:** The term refers to an opportunity for the customer to select a product from available differentiated products. Relates to creative orientation where an enterprise carries out Product Differentiation.
- Competitiveness:** A situation where an enterprise excels by having a favourable share of its innovative products in the market.
- Creative Orientation:** A product design process that is cognisant and supported by ways of initiating new unique concepts/products. The variable was measured using a checklist of 15 questions to gauge the Manager's innovation orientation, equated to the enterprise's creative orientation.
- Critical Thinking:** Rational judgment of a given situation, by analysing available knowledge. This study operationalizes critical thinking as a component of the study's independent variable and intervening variables. The variables are the product design and development strategies and the design management strategies.
- Design:** The process of planning to improve existing products or develop new ones. As a noun, "design" refers to a concept presented as a solution to a problem in a given situation.

Design Elements:	Visual building blocks that Artists/Designers use to create their Artwork/Designs. They include; Line, Shape, Form, Colour, Texture
Design Principles:	Guidelines for using the various design elements. They help Artists/Designers to create designs and control how the viewer/users are likely to react to the product. They include; Balance, Proportion, Emphasis, Rhythm, Harmony.
Design Square:	A diagram depicting the interaction between concept and knowledge spaces in the innovation process.
Entrepreneur:	A person, who initiates, establishes and is the owner of a commercial enterprise. Textile MSEs' performance depends upon the core competencies of the entrepreneur, who are usually the sole drivers of their companies or influential stakeholders.
Enterprise:	A legal business production firm that creates products for sale in the market.
General Apparel:	Clothing other than uniform clothing for schools and other institutions
Incremental Innovation:	A partial change on an existing product. Not a new product invention.
Innovation:	Creation of a new product from an existing concept or new one. It is the implementation of the creative process. Innovation was the dependent variable of the study

- Intrapreneur:** An employee who is a risk taker and innovator for the benefit of the enterprise. In product design and development process in an enterprise, the Intrapreneur can be referred to as an Internal Information Catalyst. An individual who has the passion, and time to conceptualize, and strategize for the creation of new textile products
- Intrapreneural Orientation:** A product design process that gives some employees the freedom to research/explore and develop solutions to existing challenges and also develop new products.
- Jua Kali:** An enterprise operating in an informal or semi-informal environment.
- MSEs:** Micro and Small Enterprises in this study will stand for business firms that do not have many employees, specifically; fewer than 10 employees for Micro enterprise and between 10 and 50 employees for small enterprise
- Multicollinearity:** An instance of multiple regression when the predictor variables have a high degree of correlation among themselves.
- Performance:** In this study the term refers to accomplishment by a textile MSE in regards to the number of new products / innovations. Performance /Innovation was the dependent variable of the study.
- Product Design:** A systematic process of product creation. Creativity and innovation are major components. The product creation process considers both the Internal and External factors of the enterprise.

- Product Design Guide:** Suggested concepts and procedures to consider for effective product design and development. They are not rules cast in stone.
- Product Design Strategy:** A plan that identifies and guides the creative and innovative process to develop a new or diversified product. Product design strategy was the independent variable of the study.
- Product Differentiation:** A strategy that targets uniqueness and diversity, by creating a variety of products (New or re-designed). Product differentiation enables a textile enterprise to improve its products to attract more customers. However, the propensity to differentiate products depends on the enterprise's capacity.
- Product Imitation:** A copy approach design process that results in products that are not original or unique.
- Radical Innovation:** A dramatic change of a product concept that creates a totally new product that did not exist before.
- Technology Orientation:** A product design process that considers an enterprise's internal factors mainly technological information and knowledge.
Upgrade of tools and equipment and skills.
- Textile End-use Product:** A textile consumer product. Not to be used as input material for production/manufacture, like fibre or dye.
- Textile MSE:** A micro or small firm engaged in the creation of textile products including garments, interior utilitarian and decorative products.
- Work Environment:** A designer's place of work where consideration on amenities and moral support are made for effective design work.

ABSTRACT

Kenyan textile micro and small enterprises (MSEs) face a myriad of performance challenges, key being low product differentiation. This is when enterprises imitate each other's products. Scholars have recommended research into the most effective business strategies textile micro-enterprises can utilize in order to address low product differentiation. The purpose of this study was therefore to determine the utilization of product design strategies on the performance of textile MSEs in Nairobi and thereafter develop a textile MSE product design guide that will be used in improving product innovations. Focussing on Nairobi City County's CBD, the first objective set to explain the product design strategies used by MSEs in the textile sub-sector. The second objective intended to determine the number of product innovations generated by textile MSEs in the combined year's 2016 and 2017. The third objective of the study determined how product design strategies affect textile performance. The fourth and last objective focussed on the creation of a textile MSE product design guide. This study took up a deductive, epistemological investigation that followed a pragmatic philosophy with the following theories underpinning it: the Componential Theory of Creativity (CToC); the Concept-Knowledge Theory (C-K); the Resource Based View theory (RBV) and the Dynamic Capabilities Theory (DCT). Purposive and snowball sampling were used to identify the textile MSEs before surveys with descriptive and explanatory designs and quantitative data analysis were done. A chi-square goodness of fit test revealed significant variation in textile MSEs' product innovations. The test was statistically significant for the variation in the amount of product innovations by textile MSEs. A second multiple logistic regression test indicated that both benchmarking strategies and research strategies had a significant influence on innovation. Thereafter, a Pearson chi-square independence test revealed a statistically significant association between the two strategies under study and their product innovation, however, the association strength was found to be weak as indicated by a Lambda test and confirmed by Phi coefficient as well as a contingency coefficient test. The ANOVA effect size analysis test was then used to reveal that the combined strategies had medium to small effects on the dependent variable. In conclusion, the test results showed that there was a significant influence of product design strategies on the performance of textile MSEs in Nairobi City County, Kenya. In light of this, a comprehensive product design guide, specifically tailored for textile micro and small enterprises (MSEs), and to be used in improving product innovations was developed. Other recommendations from the study include: improving the work environment and intrapreneurship orientation; using combination strategies for increased performance (innovation) and using design guides like the one proposed by the study. Recognition of design management as a critical intervening variable that affects the performance of textile MSEs was also made. Due to their limitation in size of the MSEs, the study also found the need to use association and collaboration to improve performance, while diversification strategy can be effectively employed to mitigate competition and imitations. Additionally, association and collaboration with design consultative units in Research institutions, Universities, government departments, or NGOs for robust R&D and NPD was encouraged.

CHAPTER ONE: INTRODUCTION

1.1 Background to the Study

The textile industry in Kenya is made up of a wide range of businesses with varying sizes and technologies that produce goods for both local and international markets (Kinyanjui, Kimuyu & McCormick, 2013). At one point in the early 1980s, the textile industry was a major manufacturing sector in Kenya, providing employment for nearly 30% of the workforce (Letting & Muthoni, 2010). However, after the economy was liberalized in 1990, the industry faced a significant challenge due to the influx of imported textile goods, especially used clothing. As a result, textile mills experienced a decrease in their average capacity utilization (Kinyanjui et al., 2013; Maiyo & Imo, 2012; Majienyi, 2012; Omolo, 2006). The Institute of Economic Affairs (IEA) reported that the volume of imported second-hand clothes was driven by the demand, with 185,000 tonnes imported in 2019 (IEA, 2021). This has been detrimental to local textile manufacturers in Kenya as the market has not been favourable for them (Gatimu, 2011; Omolo, 2006; Wangui, 2010).

Product design strategies are essential variables that micro and small enterprises use to create competitive product innovations. The textile sub-sector is crucial in today's economies because it takes up a significant part of many people's lives. Textile applications fall into the categories of apparel, furnishing, and industry textiles. The selection of a textile product is determined by aesthetic, physiological, psychological, sociological, and economic considerations. Therefore, the preference for one product from a group of similar products, apart from function, is usually determined by the consumer's standards of

aesthetics, comfort, durability, and care. Studies in textiles usually fall in five domains namely; art, design, science, engineering and merchandising. This study focused on the design domain while recognising that the other four domains are also important and all work together in determining the performance of micro and small textile enterprises in Nairobi City County, Kenya.

The sub-section that follows gives a background information on the definition of firm performance and how it is measured.

1.1.1 Firm Performance

The study targeted micro and small enterprises (MSEs). The Kenya MSE Policy 2020 defines micro enterprises as firms that employ 1 to 10 people and have an annual revenue of less than Kes. 1 million. While small enterprises are those that employ between 10 and 50 people and have an annual revenue of less than KES 5 million (GOK, 2012). Kenyan textile MSEs compete in a market with identical locally produced goods, knockoffs, and imported new and second-hand textiles. Micro and Small Enterprises (MSEs) in Kenya's textile industry redefine success in unique ways. While success may mean financial stability or career advancement for some, MSEs thrive on limited resources and personnel to achieve their goals. Many of these businesses operate on shoestring budgets yet manage to grow and succeed in their respective industries. The performance of a business can be measured in various ways, such as an increase in customer or market quantity or value, financial gains or profits, the number and quality of employees, business infrastructure, product range and quantity, and patents. In this research, performance was defined as the

number of new products or innovations introduced. Innovativeness is a crucial growth strategy that helps businesses gain a competitive advantage.

However, there is limited research on how product design strategies for innovation impact the performance of textile micro and small enterprises (MSEs). The knowledge on how micro and small enterprises process innovative activities remains limited, therefore their innovation capacity needs to be analysed (Pierre & Fernande, 2018). The observation also applies to the Kenya textile MSEs which is the focus of this study.

The following sub-section presents an in-depth background on product design strategies used by textile MSEs.

1.1.2 Product Design Strategies

In Kenya, Textile MSEs commonly employ various product design strategies to ensure their products are visually appealing, functional, and marketable. These product design strategies are crucial for the success of these businesses in a competitive market. The development of successful product innovations takes the route of identifying a design concept, analysing its utility and aesthetic value, and determining a suitable approach to creating the product. The product design process is influenced by intervening variables such as design management factors (the mediator variable) that influence the work environment, and demographic factors (the moderator variable) that may influence the enterprise's capabilities. An enterprise able to design their products has an advantage over others in a competitive market characterised by imitations and imported used and new textile products. Several Kenyan scholars have already identified this competitive space

that the textile MSEs operate in (Gatimu, 2011; Maiyo & Imo, 2012; Omolo, 2006; Wangui, 2010). The product design strategies chosen for the study were benchmarking, association, collaboration, original, and research; all had been empirically tested in previous enterprise studies (Dionco-Adetayo & Adetayo, 2004; Mahemba & De Bruijin, 2003; Ulrich & Eppinger, 2008). The strategies were popular for business growth and performance, and they fit into this study's concept of creativity and innovation as components of product design and development.

Studies in textiles usually fall in several domains namely; art, design, science, engineering and merchandising. This study focused on the design domain while considering that the five components support each other. Price, Stoica and Boncella (2013) write that some enterprise design constraints can be alleviated through innovation which may provide an important resource that contributes to firm success. According to Lawal, Worlu, and Ayoade (2016), SMEs in developing countries are more predisposed to incremental innovations, whether product or process-related innovation.

This study was anchored on design and business theories. The Componential Theory of Creativity (CToC) assists designers in comprehending the creative process and its components. It enables designers to build unique products by leveraging domain-relevant abilities, creative processes, intrinsic motivation, and task dedication. The C-K theory allows designers to develop novel ideas using product design methodologies to improve and evaluate concepts with acquired knowledge, resulting in innovative products. The resource based view (RBV) and the dynamic capability theory (DCT) theories emphasize

internal resources and capabilities for sustained competitive advantage and improved performance.

This study falls within the textile sector, specifically the micro and small textile sub-sector.

The following section gives a background of the Kenya textile MSE sub-sector.

1.1.3 Micro and Small Textile Enterprises in Nairobi City County

The textile sub-sector is crucial in Kenya and today's economies because it takes up a significant part of many people's lives. Textiles applications fall in the categories of; apparel, furnishing, and industrial. The selection of a textile product is determined by aesthetics, physiological, psychological, sociological, and economic considerations. Therefore, the preference of one product from a group of similar products, apart from function, is usually determined by the consumer's standard of aesthetics, comfort, durability, and care. The micro and small enterprises (MSEs) play an essential role in the economy of a country they have been said to be the backbone of the developing countries industrial process (Yusuff Chek & Hashmi, 2005). Textile MSEs, for example, are a source of entrepreneurship skills, innovation, and new job creation. The ability of small enterprises to use, adapt, and distribute new technologies is an intriguing distinctive feature. (Reznikova, 2014).

The textile industry in Kenya is made up of a wide range of businesses with varying sizes and technologies that produce goods for both local and international markets (Kinyanjui, Kimuyu & McCormick, 2013). Micro and small enterprises are relevant globally, and

strategies have been developed to integrate this sector into the mainstream of economic activities (Luiz, 2002). The MSE sector, including the textile sub-sector, has been identified as having a significant economic impact on job creation and income generation (Bowen, Morara & Mureithi, 2009; KIPPRA, 2009; Letting & Muthoni, 2010; Moyi & Njiraini, 2005; Oigo, 2012). Many scholars have written on the challenges faced by MSEs; these include; design constraints (competition, low keyed product diversification and product imitation) (Wandaka & Ngige, 2011), production constraints (capital, tools and raw materials) and market constraints (Bowen et al., 2009; Ngoze, 2004). Studies on the Kenya informal sector have shown that enterprises invest very little on innovation and instead, copy each other's products (Daniels, 2010; Lewa, 2003; Osanjo, 2012). The textile MSEs are not exempt from the challenges faced by the MSE and enterprises in the informal sector. Furthermore, due to insufficient industrial strategy and the loss of global markets, the textile sub-sector's competitiveness has decreased (Maiyo & Imo, 2012; Mastamet-Mason & Kachienga, 2012; Omolo, 2006).

Micro and small textile enterprises are critical to the Nairobi City County economy. These businesses provide critical employment and significantly contribute to the region's GDP. These companies typically employ a small number of people and specialise in the production of textiles for a wide range of applications, including apparel/clothing, fashion accessories and home furnishings. Many of the enterprises operate on a shoestring budget, making it difficult to obtain financing from traditional sources such as banks. However, there are microfinance institutions and non-governmental organisations (NGOs) that provide loans specifically for small businesses. Micro and small textile enterprises play an

important role in the Nairobi City County economy. They concentrate on creating high-quality, one-of-a-kind products using sustainable materials or traditional manufacturing methods. The government has implemented policies to encourage their expansion, such as encouraging public servants to dress in Kenyan attire on Fridays. A focus on quality, innovation, and differentiation may help MSEs succeed in their businesses.

The Kenya Institute for Public Policy Research and Analysis (KIPPRA) recommended that researchers carry out work on various aspects of the manufacturing sector including the wider issue of the determinants of competitiveness (KIPPRA, 2009). Suggestions have been given for textile apparel enterprises to enhance their businesses by following strategies for product differentiation (Kinuthia, Mburugu & Mulu-Mutuku, 2014; Mastamet-Mason & Kachienga, 2012). After conducting a survey to investigate the influence of selected product design strategies on the performance of textile MSEs, the researcher proposed a textile MSE product design guide to be used in improving product innovations.

1.2 Statement of the Problem

One of Kenya's Vision 2030 initiatives is to strengthen MSEs so that they may become significant future sectors with higher innovation and production. The government intends to increase the share of Kenyan products in the region by strengthening local production capabilities. In Kenya, textile MSEs face performance challenges of low product differentiation, with enterprises imitating each other's products. This was revealed in various reviewed studies (Daniels, 2010; Lewa, 2003; Osanjo, 2012; Wandaka & Ngige,

2011). The most effective business strategies for textile micro-enterprises to utilize in order to address performance difficulties should be researched (Kinuthia, Mburugu, and Mulu-Mutuku, 2011). It is in this context that the study sought to determine the utilization of product design strategies on the performance of textile MSEs in Nairobi City County, Kenya and thereafter develop a textile MSE product design guide to be used in improving product innovations.

1.3 Purpose of the Study

The purpose of the research was to determine the utilization of product design strategies on the performance of textile MSEs in Nairobi and thereafter develop a textile MSE product design guide to be used in improving product innovations.

1.4 Objectives of the Study

The specific objectives were to:

- i) Explain the product design strategies used by MSEs in the textile sub-sector.
- ii) Determine the number of product innovations generated by textile MSEs in the combined years 2016 and 2017.
- iii) Establish the influences of product design strategies on the performance of the textile MSEs.
- iv) Develop a product design guide for textile MSEs

1.5 Research Questions

- i) What product design strategies do the textile MSEs employ?

- ii) How many new product innovations have the textile MSEs launched in in the combined year 2016 and 2017?
- iii) What are the influences of product design strategies on the performance of the textile MSEs?
- iv) How can a product design guide for textile MSEs be developed?

1.6 Hypotheses

- H₀₁ There is no significant variation in the type of product design strategies used by the textile MSEs in Nairobi City County, Kenya.
- H₀₂ There is no significant variation in the number of product innovations among textile MSEs.
- H₀₃ There is no significant influence of product design strategies on the performance of textile MSEs in Nairobi City County, Kenya.

1.7 Rationale and Significance of the Study

The importance of micro and small enterprises in a country's economy has been recognized not just for job creation but also for swift technology adaptation. Kamal-Chaoui (2017) noted that micro and small enterprises are key drivers of innovation, with advantages over large enterprises; for example, Micro and small enterprises can operate outside of dominant paradigms and without being inextricably linked to existing products and technologies. According to Day (2000), a government must assist small businesses in order to produce and sustain high levels of new goods, markets, and jobs. This will ensure that businesses can adjust to changes in the economy. The MSEs therefore, have a leading role to play in

countries meeting the SDGs: in particular decent work and economic growth (goal 8) as well as encouraging industrialization and innovation (goal 9). The SDG targets that this study resonates with are:

Target 8.2. Increase economic productivity through diversification, technological advancement, and innovation. (IISD, 2019a).

Target 8.3. Encourage the formalization and growth of micro, small, and medium-sized enterprises through access to financial services and develop policies that encourage job creation, entrepreneurship, creativity, and innovation. (IISD, 2019a).

Target 9.b. Support the development of domestic technology, research, and innovation in developing countries. Ensure the creation of a favourable environment for industrial diversification and product value addition. (IISD, 2019b).

Colglazier (2018) states that the Science, Technology, and Innovation (STI) community can help drive progress on the Sustainable Development Goals (SDGs) by engaging on the following five elements; (1) Advising on challenges; (2) Providing indicators for monitoring progress; (3) Advising on policies and actions; (4) Searching for innovative solutions; (5) Ensuring every country and the UN have a robust science-policy interface. He stresses that the bottom three though crucial, have received much less attention. This

study relates to the two SDG's elements mentioned by Colglazier (2018, p.2), namely "Advising on challenges" and "Searching for innovative solutions"

Kenya's Vision 2030 promotes a strong, diverse and competitive manufacturing sector (GOK, 2012; SID, 2010). One of the Vision's strategies is to strengthen MSEs into key industries of the future, characterised by increased innovation and production. The Kenya Government's targets include; (1) Strengthening local production capacity. (2) Raising the share of Kenyan products in the regional market and (3) Developing niche (original) products (GOK, 2012). The Micro, Small Enterprise Act No 55 of 2012 urges MSEs to engage in research, innovation, and product creation (GOK, 2012). The World Economic Forum's Global Competitiveness Report 2019 ranks Kenya as the 95th globally, and the sixth most competitive country in Sub-Saharan African. Sub-Saharan Africa ranks as the least competitive region, with Mauritius followed by South Africa leading in the region (Schwab, 2019). The relationship between innovation and performance in enterprises is important for managers, researchers, and policymakers. Incentives for enterprises to innovate will result in improved economic performance. (Morris, 2011)

According to Mastamet-Mason and Kachienga (2012), global trends demonstrate that the textile and clothing industries contribute significantly to many national economies, particularly those in the developing world. The textile sub-sector needs to be supported since it is one of the leading MSE activities in urban Kenya (Atieno, 2009; McCormick, 2002), and a major contributor to job creation in Kenya (KAM, 2009). Trends in New Product Development (NPD) can help textile MSEs discover a niche in a competitive

industry. The information may include ways to adopt a 'Creative Orientation' sensitive to client demands as well as ways of diversifying their product base. Identical products in the market limit consumers' choice and tend to restrain sales. As an enterprise's sale of existing products declines, the new product will help sustain and increase the enterprise's growth. Therefore a 'Creative Orientation' is a critical component of product value addition, allowing textile MSEs to expand their market share both locally and globally. A vibrant market is one with a diverse product offering, allowing customers a wide 'option of change;' also, a vibrant market can secure and generate more jobs.

Textile MSEs, design students, and research institutions will benefit from the findings of the study, by providing them with information for new product design and development using strategies that are appropriate for textile MSEs. The findings of the study will be published, as well as presented at conferences and workshops. The study, therefore, fills the identified knowledge gap by contributing to the existing body of literature on textile product design and innovation.

1.8 Scope and Limitations of the Study

The target was MSEs producing textile end-products: these included fabrics and consumer textile products (Apparel and other textile end-use products e.g. mats, bags, etc.). The study focused on the Textile product design and development process since it falls within the researcher's domain of specialization (Textile design). A comprehensive study of the effects of design management factors and demographic factors on product design and innovation has been suggested as an area for further research (Section 6.4

Recommendations, page 204). The fieldwork was carried out on textile MSEs within the Nairobi City County Central Business District (CBD).

The study's limitations included difficulty in obtaining adequate responses to some of the questions posed to the respondents. This was mostly due to the MSEs' secretive nature, which was exacerbated by competitiveness and the sector's imitation orientation. The respondents were able to participate after reading the statement of confidentiality in the official introduction letter and also agreeing to the consent form. According to Bett (2022) the majority of start-ups and small enterprises thrive on their trade secrets. The delimitation of the study included the location chosen for the study, Nairobi City County (Appendix A), which was purposely selected because it is a cosmopolitan city with a large number of MSEs involved in diverse Textile activities.

An enterprise's performance can be characterized in various ways including the achievement/growth in quantity or value of customers/markets, finance/profit, human resources (number and quality), firm facilities, products (types and number), and patents. This research study defined performance as the number of new products (innovations), resulting from the enterprise's product design process.

CHAPTER TWO: REVIEW OF RELATED LITERATURE AND CONCEPTUAL FRAMEWORK

2.1 Introduction

This chapter has four parts; the introduction, the review of related literature, the theoretical framework and the conceptual framework. The review of literature on product design strategies and performance has been divided into three sections; (a) Product design process and strategy, (b) Performance of MSEs in the Textile Sub-sector, (c) Product design strategies and performance of the textile MSEs. The theoretical framework presents two theories: the component theory of Creativity also referred to as the Componential theory of Creativity (CToC) and the Concept Knowledge theory of Innovation (C-K theory). The section presents the key issues in the study in relation to reviewed models and theories. The conceptual framework sub-section gives the researcher's concept of the relation between the research variables in the study.

2.2 Review of Literature on Product Design Strategies and Performance

The section reviews literature related to the study objectives, therefore the subsections address literature about; Product design, Textile design performance and, product design strategies and performance of the textile MSEs. The review of literature has been divided into three sections; (1) Product design process and strategy (2) Performance of MSEs in the Textile Sub-sector, (3) Product Design Strategies Influence on Performance.

2.2.1 Product Design Process and Strategy

This section reviews literature on product design process and strategies in line with the first objective of the proposed study. In this study product design strategy was a skilful plan to create a textile product and is a strong pillar for enterprise sustainability. The sub-sections highlight literature on the product design process and product design strategy. An industrial design, according to the Kenya Industrial Property Act 2001, is any composition made up of lines, colours, or forms that gives a unique appearance to an industrial or handicraft product (National Council for Law Reporting, 2012). Product design is considered synonymous with industrial design (Mazur, 2019). The main difference is that industrial design refers to the design practice in a formal industrial set up that is mainly geared towards mass production.

2.2.1.1 Product Design Process.

Product design may be defined as the process of creating a product that includes the following steps: a concept, the definition of the problem/need, thinking, planning, rejection, and the correlation of the product parts to create a product that meets a need. It entails both divergent and convergent thinking and is influenced by both internal and external enterprise influences. Product design incorporates artistic (aesthetics), scientific (technology), and socio-cultural elements (Hsiao & Chou, 2004). Since the Product Design process is multi-disciplinary, the designer has to be very systematic and focused. The anagram ‘P_R_O_D_U_C_T_S’ posited by Garrat (1998) indicates the factors the designer needs to consider when designing a product; these are P_ for people, R_ for resources, O_ for opposition (competitor), D_ for design, U_ for use, C_ for construction, T_ for

technology and S_ for society. Table 2.1 below describes these design process factors and the questions the designer needs to consider and answer.

Table 2.1: Product Design Factors and Guide Questions for Designers

FACTOR	DESCRIPTION	QUESTIONS
People	Be sensitive to both the internal and external human Factors/Resources. Your internal human factor includes your team members, Know the capacity and skills they have. The external human factor includes the Customers. They belong to different age groups, different cultures, have different incomes and lifestyles. All these different aspects affect people's taste and influence what they buy.	What is your Human resource capacity? Are your staff members skilled enough for specific assignments? What is the intended market? Who are your Customers?
Resources	Material properties will determine the suitability of the product. The function, appearance, safety, reliability durability and overall quality of a product are all affected by the materials used.	What materials are suitable for the design?
Opposition	These are your competitors. Products have to compete against a range of alternatives in the same market slot. Advertising and price will affect a products competitiveness	Are there similar designs in the market? Who are your competitors? What are your competitors' strengths and weaknesses?

Design	A well designed product should successfully do the job for which it was intended. It should meet the needs of the user.	<p>What part does appearance play in the design's function?</p> <p>Have the art and design elements and principles been used effectively?</p> <p>Do the dimensions address the use and function of the product? (Ergonomics)</p> <p>Have physiological, psychological, and sociological factors of the product's use been considered?</p>
Use	Products must be designed to the highest possible standards and work reliably, safely and efficiently. Ensuring fitness for purpose.	<p>What is the function of the design?</p> <p>What must it do?</p> <p>Who could use it?</p> <p>Why should it be used?</p> <p>Where should it be used?</p> <p>When should it be used?</p> <p>How should it be used?</p>
Construction	Products to be designed considering not only materials but also construction methods.	<p>What construction methods are appropriate for the design?</p>
Technology	The type of technology incorporated will depend upon the functions of the product. Scan for new and appropriate technology that will make the work easier, reduce the work time and in the long run reduce costs	<p>Does the manufacture require any special technology?</p> <p>Are the old technologies still viable?</p> <p>Are there modern and appropriate technologies and techniques to use?</p>

Society	The manufacture, use and final disposal should minimise the chances of harm to people, wildlife and the environment	What are the likely social and environmental effects of the design? Is the enterprise working ethically?
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Source: Author.2020. Adapted from Garratt (1998)

According to Lottersberger (2012), to compete in the global marketplace, textile designers must be equipped with interdisciplinary abilities to design and develop innovative textile goods employing a design, marketing, materials, and technology interface. Lawal et al. (2016) opine that the management approach of product design as well as the existing support structure and capacity are important for innovation. Management support considerations include linkages, Research and Development (R&D) investments, and internal capability-building (knowledge and skill upgrade). Lawal et al. (2016) state that these support structures have been identified as crucial for successful innovation.

Product design comprises creativity and innovation, which is nonlinear and iterative. (Browning, Fricke & Negele, 2006). Product design is a process that touches on three bases and takes a complete circle, usually starting with the market (Consumer Requirements), then the designing process, the production and ending with the market (Product Delivery) (Nordmeyer, 2014). Therefore the beginning necessitates a clear understanding of the purpose to design, here referred to as the ‘Design Situation’. It indicates the product definition and degree of change on a product targeting the consumer. Four common design situations are Renovate, Adapt, Evolve and Discontinue. Different design scenarios necessitate different strategies to meet the specific design requirements, as described in Table 2.2.

Table 2.2: The Four Product Design Situations

	Design Situation	Description
1	Renovate	Existing products are updated by making small changes.
2	Adapt	Existing products are modified by embracing technological developments or responding to marketplace developments (with consideration to consumer demands or input supplies).
3	Evolve	New products are designed and created using the existing technology.
4	Discontinue	Breakthrough products that differentiate themselves.

Source: Author, 2020. Adapted from Vellandi (2007).

The reviewed literature indicates that textile product design is not done in isolation but is influenced by the business environment. The process is sensitive to the consumer, design, production and market trends. A designer must be able to collect, analyse and interpret facts, but should not be confined to current knowledge alone in the idea generation. To create a product that is appealing, functional, and suitable for production, intuition and imagination must be combined with technical skill. The reviewed literature was a guide to developing the research instruments that gauged the sensitivity of the textile MSEs strategies to the mentioned intrinsic and extrinsic factors.

2.2.1.2 Product Innovation Strategy

Product innovation strategies should be organized but at the same time allow for flexibility. McAdam and Keogh (2004) explain that, in small enterprises where methodologies and organizational application may vary, an epistemological continuum can be considered to develop creativity, innovation and strategies. Vellandi (2007) opines that design strategies

contribute to the creation of a comprehensive product definition and direct the development phase. Vellandi (2007) posits the following product innovation strategy categories; Design Prominence, Feature Leadership, Concentrated Application and Desirable Alternative. The four categories are described in Table 2.3.

Table 2.3: The Four Product Innovation Strategy Categories

	Strategy Category	Description
1	Design Prominence.	Design efforts deliver consumer value through aesthetics, ergonomics, packaging, presentation, and innovative materials and concepts.
2	Feature Leadership.	Design and deliver cutting-edge and highly innovative product solutions that are new and ahead of other products in the market
3	Concentrated Application.	Design a product that is suited to the needs and desires of a specific consumer.
4	Desirable Alternative.	Design the product's features and benefits within the scope of an existing product category or an established leader therein.

Source: Author, 2020. Adapted from Vellandi (2007).

No matter which product innovation strategy an enterprise selects to use, a risk analysis needs to be carried out; Vellandi (2007) cautions on the following risks: Excessive development time, limited time and financial resources, and the use of the same personnel for multiple product positions. Innovation involves a product design process that demands a methodical approach where creativity and innovative intentions are planned; however, allowance for serendipity design solutions should be accepted. Creativity and Innovation are critical processes in Product Design that requires the coordination of six separate but

interconnected resources as stated by Sternberg (2012). These are: personality, knowledge, styles of thinking, intellectual abilities, motivation, and environment (Sternberg, 2006).

According to Martin and Nguyen-Thi (2015), enterprises operate in a changing environment characterized by rapid globalization, the rise of new competitors, and demand diversification. In this setting, an enterprise's inventive abilities are defined not only by its internal competencies, such as R&D activities but also by its ability to develop organizational strategies for managing its innovation process. There are a variety of Product Design or Product Innovation strategies that an enterprise can employ to improve its design and development performance. Some of the popular strategies include; Benchmarking Strategy, Association Strategy, Collaboration Strategy, Original Strategy, and Research Strategy. (Dionco-Adetayo & Adetayo, 2004; Mahemba & De Bruijin, 2003; Ulrich & Eppinger, 2008).

2.2.1.2.1 Benchmarking Strategy.

Benchmarking is defined by Meade (2007) as the system of understanding by a firm of its processes, by acquiring vital information from enterprises that are better than them to understand, learn and improve performance. Many scholars agree with this definition; for example, Radnor and Robinson (2000) state that benchmarking compares better and best organisations by incorporating external approaches into internal activities, functions, or procedures. Benchmarking is a management tool used in the systematic process of searching for best practices, innovative ideas and efficiencies that will lead to an enterprise's continuous improvement (Wong & Wong 2008; Zeinalnezhad, et al., 2011).

An organisation uses the benchmarking strategy with the intention to transform a pre-existing situation into a better situation (Moriarty, 2011). Benchmarking is a method of evaluating an organization's internal and external operations by identifying, considering, and adopting best practices from other firms excelling in the same field (Elaswad et al., 2015; Kumar & Chandra, 2001; Moriarty, 2011).

Benchmarking is the continuous process of comparing an enterprise's strategy, products, and processes to those of firms excelling in the same field. The purpose is for the enterprise to learn how others have achieved success and then drive to equal or even outperform them. The justification lies partly in the question: “Why reinvent the wheel if I can learn from someone who has already done it?” (Dragolea & Cotirlea. 2009, p.813). Benchmarking is not the same as copying; it demands in-depth self-evaluation and the capacity to adapt strategies that have worked in different situations to your own business situation (Meade 2007, Watson 1992). “Quite often, the benchmarking concept is understood to be an act of imitating or copying. But in reality this proves to be a concept that helps in innovation rather than imitation” (Dattakumar & Jagadeesh, 2003, p. 176)

Benchmarking entails more than simply compiling data but adopting a new approach after assessing the best practice to introduce, in such a way that it will be understood and realize its full potential (Elaswad et al., 2015; Kumar & Chandra 2001; Moriarty 2011). Most of the modern-day research on benchmarking within manufacturing micro and small enterprises usually deals with the improvement boundary relationship of budgetary parameters, however not with typically execution or improvement with respect to

production and operations management (Elaswad et al., 2015). The need for benchmarking strategies for further improvement in manufacturing enterprises is undisputed (Elaswad et al., 2015). However, micro and small enterprises face difficulties in using benchmarking for their growth due to issues relating to diverse inputs and outputs of this sector. The oldest and most widely used type of benchmarking is product benchmarking. The others include product, function or process, best practice, and strategic benchmarking.

Benchmarking is a four-stage iterative procedure that includes Bench Learning, Benchmark Measurement, Bench Monitoring, and Bench Action (Elaswad et al., 2015). Bench learning is a method of enhancing practices by analysing the practices of high performers and determining whether or not true learning has taken place (Harris, 2001). It puts emphasis on the combined activities of benchmarking and learning within an enterprise (European Commission 2017). Benchmark measurement refers to a set of measures or standards used to determine performance targets in product design and development (Benchmarking 2020). Measures entail the identification of best practices but also comparing the business's processes and performance to those of competitors. Bench monitoring involves the identification of best practices and makes comparison between the practices of a given enterprise. Benchmarking entails taking the steps necessary to close performance gaps (Benchmarking 2020).

The objective of benchmarking for micro and small enterprises is to adopt the appropriate best practices for assessing and planning the enterprise's working process (Elaswad et al., 2015). According to Dattakumar and Jagadeesh (2003), it is a strategy that decision makers

can rely on for continuous improvement of product quality. The continuous process that aims to improve the work process and product quality involves principles like; innovative thinking about problems, and providing data on performance and leads to the establishment of specific goals (Kumar & Chandra, 2001). The researchers summarize that in manufacturing environments, benchmarking is a comparison of business performance and a comparison of product performance, and that it arises because of three situations; fierce rivalry, markets that are fragmented and competitive, and a wide range of fast evolving technologies. Benchmarking is a change catalyst; it is more than just competitor analysis or copying; it is a process that lays the groundwork for creative breakthrough by identifying the highest levels of excellence for products and processes and then making the necessary improvements to meet those levels (Kozak & Nield, 2001).

Competition will always be in the marketplace, and benchmarking as a tool assists businesses in determining their market position. Benchmarking as a technique has received a lot of attention due to its effectiveness. It is also a tool that helps organizations identify processes that need to be changed in order to achieve specific strategic goals and objectives (Krishnamoorthy et al., 2014). To become the best you need to learn from the best (Kumar & Chandra, 2001). Zairi (2005) listed the benefits of effective benchmarking as; (a) Motivate ongoing improvement and reengineering. (b) Shorten the design process by giving an indicator to judge the amount of progress that can be made. (c) Establish the final position after improvement (d) measure important performance indicators. (e) Assist the enterprise's management in selecting suitable improvement tools for the identified performance gap.

Benchmarking is widely used in successful businesses; however, it is a relatively underutilized tool in R&D and innovation (Elaswad, et al., 2015). Benchmarking is widely used in successful businesses; however, it is a relatively underutilized tool in R&D and innovation (Elaswad, et al., 2015). Benchmarks should be used to assess innovativeness in terms of the activities that organizations must undertake. This is because company innovativeness is critical for long-term growth (Elaswad et al., 2015).

The produced innovation profiles and product benchmarks for manufacturing SMEs in specific sectors will indicate the optimum position for SMEs with that of a similar topology and defines attributes or properties that SMEs have to put in place to reach that position. However, some SMEs have many difficulties in converting R&D into effective innovation that will lead to potential growth (Elaswad, et al., 2015; O'Regan, et al., 2006). Some challenges/pitfalls of benchmarking includes the risk of becoming too dependent on benchmarking instead of exploring inventive or innovative process improvements. When employed excessively, it can maintain a culture of "sameness" and hinder creative thought. Benchmarking is less effective for those who have developed innovative and efficient methods tailored to their own environment. It can, however, be quite valuable for individuals dealing with inefficient procedures and looking for better methods to do things (Henczel 2002).

Studies that allow SMEs to improve their understanding of performance assessment and benchmarking, as well as exchange best practices across SMEs in the field, are needed (Zeinalnezhad et al., 2011). While the advantage of benchmarking in both large and small

firms are acknowledged in theory, there are few empirical studies that show small business owner-managers that such an activity can lead to increased performance (Elaswad et al., 2015).

2.2.1.2.2 Association Strategy.

In this study association strategy refers to support from associates and corporates and was taken to be synonymous with networking strategy. Networking is a process that encourages individuals or groups to share information and ideas, usually in an informal social setting. The purpose may be for social, professional or business purposes. Professionals connect with their network(s) via a chain of symbolic ties and contacts in order to enlarge their circles of acquaintances, to discover about activity opportunities in their fields, and to increase their awareness of information and trends in their fields (Mawira, 2019). Other reasons for networking include marketing of products, outsourcing for raw materials, gaining new skills and seeking for labour support in the industry (Mawira, 2019). Small enterprises that maintain consistent relationships with external actors are more likely to be successful because such relationships provide a regular and dependable supply of resources (Abeka, 2011).

The role of network in creative industries cannot be underestimated. The connectedness of both creator and consumer in the innovative industries has led to substantial reduction of uncertainty in manufacturing and consumption of innovative products and services (Mawira, 2019). Networks may be categorised in two ways: personal networks, which include business owners' personal relationships with family, friends, and extended social

circles; and professional networks, which include an MSE's relationships with suppliers, customers, and competitors (Reeg, 2015). Empirical research has shown that the monetary success of MSE's in many nations depends on informal personal networks (Abeka, 2011). A number of studies endorse that private and professional networks play a critical role in the process of MSE conception, growth, and job creation (Abeka, 2011; Mawira, 2019; Oigo, 2012; Reeg, 2015; Ziggers & Henseler, 2009).

Enterprises have also been observed to encourage both horizontal and vertical connections with other businesses. Vertical linkages describe a firm's forward and backward ties with buyers and suppliers, whereas horizontal linkages describe the relationships between businesses that provide comparable products and services (often competitors within the same industry) (Reeg, 2015). There is no single factor that drives enterprise development and job creation; however, a variety of internal and external factors come into play. The factors include connecting with others, developing and fostering relationships, gathering knowledge, accessing the hidden talent pool, learning about potential career paths and sharing resources (Reeg, 2015). Therefore networks can lead to sustainable competitive advantage (Ziggers & Henseler, 2009). It has been noted that network referrals can make up 80%-90% of new business revenues (Cattelan, 2019).

2.2.1.2.3 Collaboration Strategy.

In general, innovations are not based entirely on the operations of a single company. The majority of innovation processes involve several players. In order to tap alternative sources of knowledge and technology, the development of new and improved products requires an

active search process involving several enterprises and institutions (De Bresson, 1996). Enterprises that engage in innovation activities recognize the importance of forming R&D collaboration in order to obtain skills that cannot be produced in-house. Collaborations of this type are characterized as partnerships aimed at achieving a common goal, such as the development of new and improved products (Becker & Dietz, 2004). Collaboration has been defined by the Oxford Learner's Dictionary (2021) as “the act of working with another person or group of people to create or produce something”.

Ming and Lu (2003) state that, in today's competitive business environment, collaboration is one of the most effective strategies, notably in product customization, development, manufacturing, supply, and services. A study by Findik and Beyhanb (2015) found that external network-collaboration and product-oriented innovation had a positive link. In other words, enterprises that engage external partners during the innovation process witness better results in their product lines. The researchers further state that enterprises' production processes benefit from external partnerships as well.

Science, Technology and Innovation for Africa, (STISA) 2024 appeals to African countries to consider innovation and entrepreneurship as key determinants for sustained development (African Union Commission, 2014). Within the overall AU Agenda 2063, STISA-2024 is a continental blueprint for spurring Africa's transformation to an innovation-led, knowledge-based economy. The STISA promotes a multidisciplinary and multi-sectoral approach to open innovation and entrepreneurship, which are critical to building a knowledge economy and long-term socioeconomic growth in Africa. Increased networking

and collaboration between education and research, as well as private and public sector stakeholders, will aid in the co-creation, adaptation, and commercialization of research and innovation outputs in line with national and regional policy objectives (African Union Commission 2014).

Najib and Kiminami (2011) found that enterprises interact to achieve a synergistic impact in numerous domains of operation. Gudda, Bwisa and Kihoro (2013) established that clustering and collaboration significantly enhance product innovativeness. They noted that, since innovation was influenced by collaboration, it would be advantageous for manufacturing micro and small enterprises to maintain their close links to sustain their innovativeness. Enterprises should collaborate in industrial design and engineering design processes to apply outside-in and inside-out methodologies that are appropriate for their situations and objectives in order to flourish in a highly competitive market (Ming, & Lu, 2003). Gachara and Munjuri (2018) recommend that micro and small enterprises can collaborate with large organizations that are well-positioned to offer a wide range of services and to invest in innovative activities. This will reduce costs while achieving the desired goals. This study associated collaboration with partnerships with other enterprises or individuals for the design and development of textile products.

2.2.1.2.4 Original Strategy.

Originality is a product attribute identified as one of the significant dimensions of new product success (Li, Zhang, & Wang, 2014). Originality increases the popularity of a product when the usefulness of the product is perceived to be high (Moldovan, Goldenberg,

& Chattopadhyay, 2011). Agogué, Kazakçi, Hatchuel, Le Masson, Weil, Poirel, and Cassotti (2013) posit that obvious solutions which are usually spontaneously activated, constrain the generation of new original solutions. The scholars refer to this trend that is an obstacle to creativity and originality as the fixation effect. The effect leads to the generation of more or less an imitation/copy product. Mayseless, Eran and Shamay-Tsoory (2015) assert that original ideas require the capacity to develop associations as well as the ability to overcome automatic common responses (the fixation effect). Originality is judged by the idea's rarity and uniqueness when compared to other concepts. Recently acquired knowledge can restrict one's ability to create original ideas; however an experienced designer will not be fixated on a current design fad but use the knowledge to generate original concepts.

2.2.1.2.5 Research Strategy.

The Oxford dictionary defines research as “a careful study of a subject, especially in order to discover new facts or information about it”. The connection between research and innovation is intricate, involving a number of iterative steps comprising learning and feedback. The steps move both ways to and from research, design and development (Branscomb & Auerswald 2002). According to Mattes, Zanker, and Som (2015), innovation methods based on R&D activities are not appropriate for non-R&D-intensive companies because their innovation processes are less formalized and heavily customer driven.

Research in small firms can include the study or discovery of existing facts in the

market/sector in order to improve products and firm performance. R&D serves at least two functions. First, it creates knowledge within the organization in order for product inventions. Second, it enhances the firm's ability to comprehend and acquire knowledge from outside the firm, such as knowledge spillovers generated by other organizations (Stam & Wennberg, 2009). The organisations that have been recognized as leaders in knowledge transformation critical to product innovation include universities and research institutions (Gudda, Bwisa, & Kihoro, 2013). The university/research institutions are recognized in the above regard because of their exceptional advantage in terms of technical capabilities (Gudda, Bwisa, & Kihoro, 2013; Moyi & Njiraini, 2005).

Stam and Wennberg (2009) suggest that the growth ambitions of the entrepreneur of the small enterprise appear to exploit external knowledge through R&D efforts. Past research has revealed that, while small enterprises participate in R&D less frequently than large enterprises, when they do, they utilise their inventive inputs more efficiently (Stam & Wennberg, 2009). According to Atkinson and McKay (2007), empirical research and company activity surveys have revealed that innovation leads to new and improved products and that a company's consistent high levels of innovation result in a strong growth rate for the economy.

Several innovation studies across firms have taken R&D activities as a starting point for analysis on innovative activities (Mairesse & Mohnen, 2004; Martin & Nguyen-Thi 2015). “Micro businesses - firms with fewer than 10 employees - are often associated with marginal businesses that have no growth options and limited R&D investments” (Baumann

& Kritikos, 2016 p. 1). According to Baumann and Kritikos (2016), a micro enterprise is less likely to start an innovation process as compared to a large enterprise. One reason for the tendency is high R&D investment. The liquidity constraints may require that the micro and small enterprises become innovative with lower or no investments in R&D (Baumann & Kritikos 2016). Larger enterprises might focus on process innovation more often than micro firms (Baumann & Kritikos, 2016). Larger enterprises typically produce more products, resulting in a higher level of product diversification, and have an environment in which costs cutting through process innovation may be a better option. Di Cintio et al. (2017), mention that studies on SMEs have under-reported the role played by R&D in SMEs. R&D has a significant impact on a company's ability to offer a new product or process. The effects are more noticeable on product innovation than on process innovation. Existing knowledge about the relationship between R&D, innovation, and productivity can be applied to small enterprises (Baumann & Kritikos, 2016).

Innovation has long been regarded as a critical factor in SMEs' survival, growth, and development. Firm size and R&D have gotten the most attention from researchers when it comes to determining innovation. Raymond and St-Pierre (2010) confirms that the impact of R&D on product innovation is mediated by process innovation. This implies that process innovation needs to be considered in the study of product innovation. It has also been found that R&D investment increases firm productivity (Siliverstovs, 2016).

2.2.1.2.6 Diversification and Differentiation Strategy

Although there are many objectives an organization would want to achieve these days, the two major ones are: (a) to achieve a competitive advantage position and (b) Enhance their organization's performance in relation to that of their competitors (Dirisu et al., 2013; Raduan et al., 2009). A differentiation strategy would give these organizations more leeway to create products with more valuable, desirable features to meet market demands (Dirisu et al., 2013).

Product diversification is the practice of modifying a current market product by adding value to expand the potential market for the enterprise by luring new customers and retaining the current ones. In other words, a new alternative product is offered as a new product to the existing customers at the same time the new version appeals to a different group of customers. Differentiation allows for different product lines to be created for the different market segment, and the approach focuses on creating unique products which should differ from the products of competitors (Kukartsev et al., 2019). The difference between the competitors could be in the brand image, technology, function, or quality (Amar, 2015). Usually, product differentiation is based on features, performance, or style and design. Enterprises may differentiate from their competitors on product attributes such as consistency, durability, reliability or repair ability (Khokhar, 2019).

Amar (2015) states that if micro and small enterprises want to be continuously successful, they should use the knowledge acquired from customers to create special attributes or unique products that will appeal to the customers and maintain their loyalty. Product

differentiation can be distinguished between horizontal and vertical differentiation, where horizontal differentiation refers to the situation where the products serve the same purpose and cost the same. In vertical differentiation, the products on offer serve the same purpose but have different qualities therefore different costs (Amar, 2015).

A differentiation strategy entails the enterprise developing a product or service that is unique in a way that the client values because their demands are met. Product differentiation increases an organization's general competency in product upgrading and attracts more customers (Dirisu, Iyiola & Ibidunni, 2013).

2.2.1.2.7 New Technology Strategy

Since the Industrial Revolution, enterprises have relied on technology as a driver of progress. Despite their increased proclivity for product innovation following the implementation of technical innovation procedures, many MSEs have not prioritized technology adoption as standard practice. Many companies lack a clear product innovation and technology strategy, despite the strategy being an essential and strong link to positive performance in product innovation (Cooper & Edgett, 2010). The product innovation and technology strategy is driven by the leadership team's strategic vision while considering the enterprises and client interest, so as to be competitive (Mwika, 2017).

The growth potential related to innovation in SMEs has been indicated by Abouzeedan (2011) to come from three input parameters: technology, R&D, and generation of competitive edge. The approach of introducing an innovation and technology strategy

should ensure that all team players embrace the strategy. Enterprises should use a top down approach when introducing and implementing the technology strategy (Mwika, 2017).

An enterprise's technology strategy should be used to push the company beyond its comfort zone. De Meyer (2006) stresses that there should be a precaution not to constrain technology development to a very narrow path because it destroys creativity and creates a false sense of security. It should not be assumed that the use of technology will automatically result in improved enterprise performance. Successful implementation of technology strategies will depend on both internal and external enterprise factors such as; knowledge, skill capacity, resource capacity and needs of customers. The interaction between tacit and explicit organizational knowledge and the latent and explicit needs of the customers, as well as the evaluation of the capacity of the organisation to carry out the projects, are critical considerations in adopting a technology strategy.

A common denominator in the growth and competitiveness of manufacturing SMEs is information communication technology (ICT) (Fleet, 2012). According to Fitriany and Abidin (2018 p. 123) “access to good information can create competitive advantage and superior value for consumers”. Elasad et al. (2015) advise that firms need to integrate information systems in their business strategy plans for innovation. The incorporation of ICT in product design and development together with Computer Aided Design (CAD), Computer Integrated Design (CID) and Computer Aided Manufacture (CAM) are all associated with Advanced Manufacturing Technology (AMT). Hewitt-Dundas (2004) mentions that traditionally technology has been thought of as solely a tool for carrying out

business strategy. As a result, AMT has the ability to have a direct influence on an enterprise's innovation strategy. AMT's benefits arise from alignment between the technology and organization vision and mission. AMT also allows flexibility for increased quality, faster delivery and greater customization, thereby increasing competitiveness (Yusuff, et al., 2005). The scholars stress that "to be able to survive and grow, SMEs must adopt strategic technologies and innovative management practices to survive" (Yusuff, et al., 2005, p, 23).

2.2.2 Performance of MSEs in the Textile Sub-sector

This section reviews literature on the performance of MSEs in the textile sub-sector in line with the second objective to determine the number of product innovations generated by textile MSEs. The sub-sections highlight literature on performance and productivity Imitation of products, and Competitiveness of Enterprises.

2.2.2.1 Performance and Productivity.

The success and capability of a business are determined by its performance (Rosli & Sidek, 2013). Performance is a multifaceted concept that is commonly related with growth, survival, success, and competitiveness (Hedfi-Khayati & Zouaoui, 2013). Traditionally performance has been measured using systems relying on financial accounting measures, e.g. revenue growth rate, return on investment, market share and unit costs (Martinsuo & Nissinen, 1998). Atieno (2009) states that "Firm performance can be measured using different indicators, like profitability, growth in employment, production level, or even sales" (p. 19). Customer satisfaction, staff contentment and business success are all important indicators of enterprise performance (Susman, Warren, Ding & Stites, 2006).

Generally an enterprise's performance is successful when set goals are met. Performance is measured in terms of achievement/growth in quantity or value of the following: profit, personnel resources (number and quality), company facilities, products (types and number), and patents. The effectiveness of an action or the final outcome of that action has been defined as performance (Neely et al., 2000). The output of product innovation was used as a performance indicator in this study.

Product design is a typical expert endeavour where both short-term and long-term competence development are critical (Martinsuo & Nissinen, 1998). This statement supports the idea that product performance will be determined not only by competence in the product design process, but also by domain skill competence. In their article on the relationship between innovation and performance, Loof and Heshmati (2006) state that there are two ways to quantify innovation output: the percentage of sales from new items and the number of patents or product announcements. In this study, performance refers to higher productivity as a result of the enterprise's effective introduction of a greater number of new products.

It is worth noting that knowledge and competence increase organizational productivity by reducing the amount of time and money spent on experimentation (Bradley 2011). This implies that the productivity attributes of time spent, capital/expense, knowledge (context and strategy), and competence will most likely be the source of an MSE's product competitive advantage. Progressive Edge Consulting (2012) agrees that the following are key drivers of productivity gains: the number and quality of human resources, the quantity,

and quality of capital, innovation, and technical improvement. The literature reviewed suggests that low product differentiation may need to be mitigated through capacity development in knowledge and competency. The C-K theory (As explained in section 2.4.2 on page 38) acts as a good guide on how knowledge can be used for product differentiation.

2.2.2.2 Imitation of Products.

Imitation is the copying of product designs or innovations developed by others. Imitation does not expand the knowledge existing in the world; it only expands the knowledge existing in the enterprise that adopts it (Pérez-Luño, Valle & Wiklund, 2007). Hu (2018) mentions that some enterprises use imitation not only as a powerful mechanism to improve performance but also as a source of knowledge. An imitation approach will usually be cheaper for an enterprise than to design their product. The low cost incurred by the imitators enables them to have an unfair competitive advantage; this may negatively affect the incentives to execute research and proper TPD (Cappelli, Czarnitzki, & Kraft, 2013).

Enterprises have to protect their innovations through patents. Sometimes open source (free) design and technology concepts from the industry are available for enterprises to make use of. These open source concepts are also referred to as ‘Design spillovers’ (Cappelli, et al., 2013). Design spillovers are positively valued by the receiving company, and viewed negatively when taken up by a competitor. However, conflicting evaluations do not exist if spillovers are from a source such as a research institution or directly from customers (Cappelli, et al., 2013).

2.2.2.3 Competitiveness of Enterprises.

Competition determines the appropriateness of a firm's operations that can contribute to its performance. Knowledge and technology have been highlighted as essential aspects in boosting competitiveness. According to Thacker and Handscombe (2003), firms that can use knowledge, technology skills, and experience to produce new products, processes, and services are more likely to have a competitive advantage, regardless of size or assets.

Using creativity and innovation strategies allows enterprises, and even entire economies, to gain and sustain the competitiveness required in a free market (Mwasi, 2005). The dimensions of competition may give a firm competitive advantage if it is sensitive to the competitive scope and organisational capabilities (Jones, 2003). The author argues that the competitive process is driven by six competencies namely; entrepreneurial opportunity, relationship, conceptual, organisational, strategic and commitment competencies. MSEs often have a set of skills that are quite unique to them. Their success is determined by the entrepreneur's or organisations essential capabilities, which enable it to capitalize on opportunities (Hunter, 2007). The imitation of the local product designs by competing Textile enterprises can be mitigated by embracing the above-mentioned competencies. Since product design can have a significant impact on a company's competitiveness, it may be vital for the design function to be better connected with the rest of the company's functions. The literature reviewed suggests that; Product design strategies are needed to improve the performance of Textile SMES.

2.2.3 Product Design Strategies Influence on Performance

This section reviews literature on the influence of product design strategies on the performance of the textile MSEs, in line with the third objective of the proposed study. The other sub-sections highlighted are literature on creativity in the product design process and innovative product designs.

2.2.3.1 Strategy and Performance.

According to Okpara (2007), most businesses must continuously upgrade their current products by consistently creating essential adjustments in order to thrive and prosper. This suggests that Product design strategies are important for Textile MSE's performance. The designer should innovate beginning with the enterprise's core range of products while preserving the company's basic manufacturing soul (Lottersberger, 2012). According to Hedfi-Khayati and Zouaoui (2013), different firms use different performance strategies; hence a firm's performance achievement is concentrated in its strategy.

2.2.3.2 Creativity in Product Design.

Creativity, which is a powerful driver of an organization's growth, has emerged as a key competitiveness factor for both individuals and organizations (Tian & Hu, 2016). Amabile (1996, p, 1) states that, "Creativity is the production of novel and useful ideas in any domain". Creativity is a mental and social process involving the discovery of unique and new ideas or concepts, or new associations of existing ideas or concepts. A thriving fashion industry relies heavily on design and creative talent. Professional knowledge and expertise, a creative attitude and ability, and knowledge from other fields are all excellent sources of truly unique concepts that customers have yet to perceive (Tian & Hu, 2016). To be creative

one has to be free, flexible and 'think outside the box'. According to Sternberg (2012), creativity necessitates a balance of synthetic, analytic, and practical talents. The ability to generate new and exciting ideas is referred to as synthetic ability. Analytic ability refers to critical thinking that is having the skills to analyse and evaluate ideas, while practical ability enables one to translate theory into practice.

Manamela (2004) advises that one should not cling to the old ways of doing things because that's the way it has always been done. Creativity needs to be flexible since rigidity seldom yields new concepts. The study also looked into whether textile MSEs are versatile in their design process and think outside the box. It also sought to ascertain whether textile MSEs' insensitivity to the creative process leads to an imitation orientation. A design process that emphasizes creative techniques improves the overall performance of innovative product design (Hsiao & Chou, 2004).

An enterprise must rely on highly creative personnel for product and process renewal; consequently, a conducive work environment for these workers is vital. Sternberg (2012), the developer of the Investment Theory of Creativity specifies that creativity involves the following seven aspects: (a) abilities, (b) knowledge, (c) styles of thinking, (d) personality attributes, (e) motivation, and especially intrinsic motivation, and (f) environment (Sternberg, 2006). Communication is another factor to consider, according to Vissers and Dankbaar (2002), who note that interacting with external partners is crucial since it makes new ideas more plausible and accepted. A litigious consideration is whether the creative process should be intentionally planned or should be a serendipitous, random approach.

The study thus set out to assess whether textile MSEs rely on chance (luck) to create new products or if they adopt a deliberate strategy aimed at ensuring growth performance and sustainability.

The enterprise change driver incorporates a product design approach that is sensitive to creativity and innovation. Creativity is the starting point for innovation, and innovation is the implementation of creative inspiration. The subject of innovation has risen in prominence to become a global policy issue. This innovation prominence at the enterprise level is represented by product design strategies and the significance of this is summarised by Best's (2011) statement: "Design is what links creativity and innovation – it shapes the ideas so they become practical and attractive propositions for users and customers" (p.28).

2.2.2.4 Innovative Product Design.

The importance of micro and small businesses in economic growth places them at the center of policymaking. Small businesses are a source of entrepreneurship, innovation, and the creation of new jobs. They have a unique ability to apply, adapt, and disseminate new technology (Reznikova, 2014). Despite the interest in small enterprise performance, the knowledge base about how MSEs undertake innovative activities is scarce.

Product innovation is the bringing forth of new or improved goods or service of value to users (Boachie-Mensah & Acquah, 2015). According to the OECD (2005), innovation can take the form of a new product (good or service), a new process, a new marketing strategy, or a new organizational strategy. "It is the process that covers product design, production

system design, product introduction processes and start of production” (Johansson, 2008). Radical and incremental are two common types of innovation. Although innovation and creativity are linked, the nature of their interaction is complex. Amabile (1996) posited that, “Innovation is the successful implementation of creative ideas within an organization”. While creativity is traditionally thought to be a personal trait, innovation refers to an organizational process. This traditional perspective suggests that an organization's processes will be updated by highly creative employees (Thomas, Miller & Packham. 2011).

Rapid, successful product design and marketing are essential parts of a company's business strategy. Not only must products meet quality and production speed criteria, but they must also include innovative qualities (Hsiao & Chou, 2004; Nordmeyer, 2014). To remain competitive in today's modern world, enterprises must embrace innovation (Teece, 2007). Several guidelines for innovation exists; systematic innovation, according to Peter Drucker (a renowned leader in management education), can be achieved by monitoring seven (7) sources to uncover chances for innovation. The "Seven Sources of innovation" are unexpected occurrences, inconsistencies, process needs, industry and market changes, demographic changes, changes in perception, and new knowledge. The last four refer to opportunities that exist in the external social and intellectual environment (Eaton, 2012). The study inquired into which of the internal and external environment innovation opportunities are being engaged in the textile MSEs design process. Types of Innovation include; Breakthrough/Radical (New Product), Incremental/Renovate (Product Differentiation), Adaptive (Use of New Material and Technology), Organizational (New

Processes of Production), and Discontinue (Target New Markets), (Dionco-Adetayo & Adetayo, 2004; Vellandi, 2007).

Findings from a study by Gatimu (2011) titled ‘Deterrents in benchmarking by SME garment firms in Nairobi’ indicated that enterprises had adopted various innovations approaches to cope with competition. The study notes that the innovations were incremental but not radical, and included product, market innovations and new sources of supply. While SMEs in developing countries do not selectively focus on both product or process improvements, they are inclined to incremental improvements, whether product or process innovations (Lawal et al., 2016).

The reviewed literature indicates that many studies have been done on types and sources of innovation. A study by Boachie-Mensah and Acquah (2015) confirms a positive relation of product innovation on enterprise performance. Innovation strategy is critical when creating products for consumers; it can also give a competitive advantage over rival enterprises. The literature thus informs the supposition that; textile MSEs may need to embrace innovative and effective product design strategies that will not lead to imitation but product differentiation. Therefore this study also inquired about which and how the innovative strategies are being employed in the product design process of textile MSEs.

2.3 Identified Gaps/Leads for Research from the Reviewed Literature

The knowledge on how micro and small enterprises process innovative activities remains limited, therefore their innovation capacity needs to be analysed (Pierre & Fernande, 2018).

According to Price, Stoica, and Boncella (2013), some enterprise design restrictions can be eased through innovation, which may be a significant resource that contributes to firm performance. The search for innovative approaches, according to Colglazier (2018), is one of the five ways the science, technology, and innovation (STI) community can advance the Sustainable Development Goals (SDGs).

The reviewed literature indicates some potential opportunities in product design process research; these include (a) to establish how the consumer and competitor dynamics influence the design process within textile enterprises, (b) to establish the extent of production capacity and competence influencing the design process of textile enterprises, and (c) to establish the rating of product design factors (as introduced in the Garrat anagram ‘P_R_O_D_U_C_T_S’) used by Textile enterprises. The literature also reveals potential research opportunities in Product Design Strategies, for example, to establish whether enterprises have the capacity for organizational strategies to manage innovation.

2.4 Theoretical Framework

The theories chosen to guide the study include those of product design and business management. The conceptual theory of creativity (CToC) and the concept-knowledge theory (C-K Theory) reflect creative and innovative processes in product design and development, respectively. The CToC and C-K theories explanations were given more priority since the research study had a product design orientation.

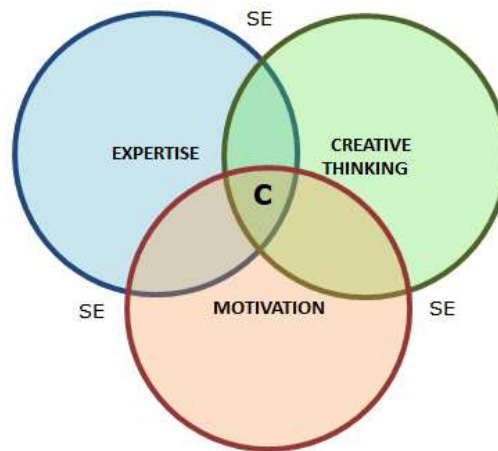
The product creation process considers both the Internal and External factors of the enterprise. Therefore the Resource-Based View (RBV) theory was selected to emphasize the importance of a firm's internal resources and capabilities in achieving sustained competitive advantage. The dynamic capabilities theory (DCT) was selected because it highlights the enterprises competencies available for improved performance. Dynamic capabilities refer to an enterprise's ability to recognize and capitalize on opportunities, as well as integrate and reconfigure its internal and external competencies, in order to respond to rapidly changing business environments.

The CToC theory was selected because it is the most popular model that introduces components inherent in individual and team creativity, and explains how the individual designer and the team can be influenced by enterprise factors essential for innovation. The C-K theory was selected because as explained by Hatchuel, Masson and Weil (2004), it provides a formal basis to understand existing design concepts as particular examples of a unified reasoning model. Additionally, it places creative thinking and innovation at the centre of the design theory.

2.4.1 The Componential Theory of Creativity (CToC)

Teresa Amabile established the Componential Theory of Creativity (CToC) in 1983. It is a realistic representation of the psychological components required to produce creative work (Amabile, 2012). The CToC asserts that intrinsic and extrinsic aspects must be explored in order to improve enterprise creativity. The CToC specifies four aspects that must be considered: three within the individual/Creative team – applicable creative

thinking skills, appropriate expertise and process knowledge, and task motivation – and one outside the individual – the social environment in which the individual works. The components are illustrated in Figure 2.1. The CToC stipulates that “creativity should be highest when an intrinsically motivated person with high domain expertise and high skill in creative thinking works in an environment high in support for creativity” (Amabile 2012, p. 3).



Legend

- EXPERTISE:** Refers to a skill where knowledge, technological, procedural, and intellectual ability are applied.
- CREATIVE THINKING:** Refers to using the mind in a flexible and imaginative way to solve a challenge.
- MOTIVATION:** Refers to an inner passion to solve the problem at hand. (Intrinsic Motivation)
- C= CREATIVITY:** Refers to process of individual creativity and organizational innovation.
- SE= SOCIAL ENVIRONMENT:** Refers to the work environment intervening factors in the creative process (Extrinsic motivators).

Figure 2.1: Component Model of Creativity

Source: Author. Adapted from Amabile (1998)

"The componential model of 1988 is the oldest theory of creativity and innovation in organizations, and still the only widely-cited theory to attempt a comprehensive description of both the process of individual creativity and the process of

organizational innovation, as well as the ways in which the two are linked through mutual influence." (Amabile & Pratt, 2016 p. 158)

The Amabile's component model of 1988 was further improved to elucidate the symbiotic relationship of the individual/team creativity aspect and the enterprise innovation aspect in product design (Creativity and Innovation) as illustrated in Figure 2.2.

COMPONENTS INFLUENCING INNOVATION AND CREATIVITY

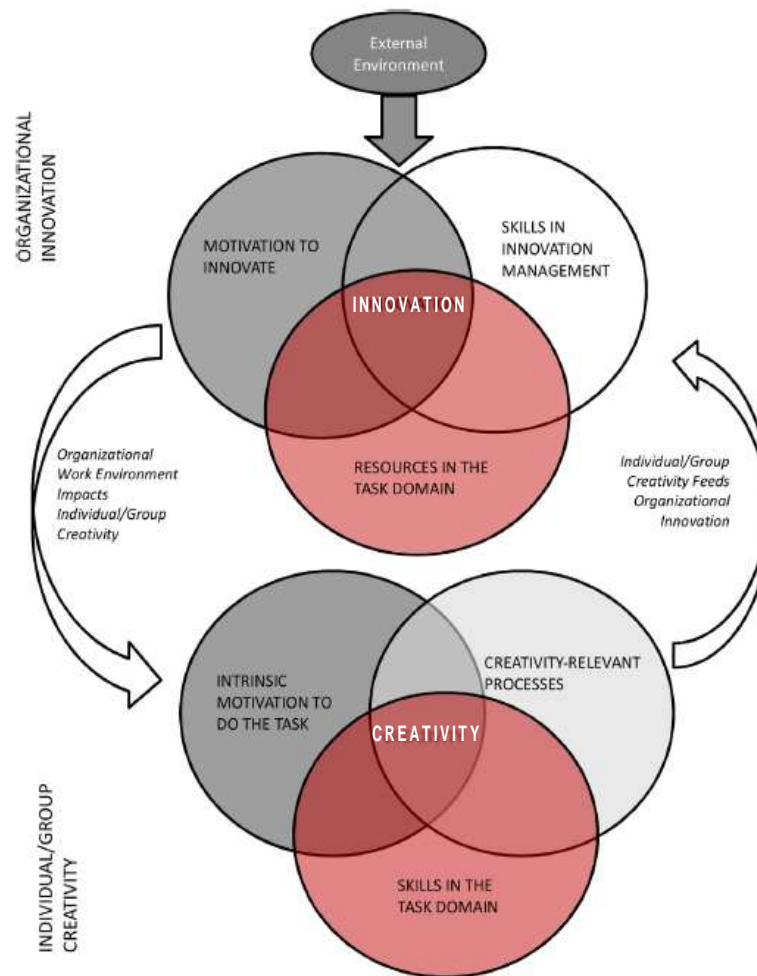


Figure 2.2: Interaction between Creativity and Innovation

Source: Amabile & Pratt (2016)

The symbiotic relationship as illustrated is that individual/group/team creativity feeds organizational/enterprise innovation; organizational work environment also impacts

individual/group/team creativity. This study assessed the presence of the creativity components in the design strategies and processes in textile MSEs in Nairobi.

2.4.2 Concept-Knowledge Theory (C-K theory)

The 'Concept-Knowledge theory' (C-K theory) advanced by Hatchuel and Weil (2003), emphasizes two spaces in the innovation process; the concept space (C) and the knowledge space (K). Knowledge has been viewed as one of the most vital resource in the organization as acknowledged in the Knowledge-Based-view (KBV) that can be said to be an adjunct of the Resource Based-View (RBV) of the firm (Musyimi & Mwasiaji, 2023; Ndabari, 2021). Knowledge is an essential and valuable resource for an enterprise. As a type of intellectual capital, KBV is essential to encouraging creativity and innovation as well as increasing overall efficiency in dynamic business situations. The KBV, which is a business management strategy, can be related to the C-K theory since it emphasises how knowledge and expertise influence business performance. The C-K model provides a precise definition of design and a high level of rigour and modelling, with creative thinking and innovation not being exterior phenomena but rather the essential heart of the theory (Hatchuel et al., 2004).

The theory depicts the relationship between spaces and how they enhance the creative process while also increasing the prospects of incremental and radical innovation (Ruiz, 2009). It models design dynamics as a joint expansion of a space of conceptions (C) and a space of knowledge (K), using four operators ($C \rightarrow K$), ($K \rightarrow C$), ($C \rightarrow C$), ($K \rightarrow K$). A diagram known as a 'design square' depicts the interaction between the operators (Figure

2.3). These operators capture the dynamism of the innovation process as well as the range of design scenarios.

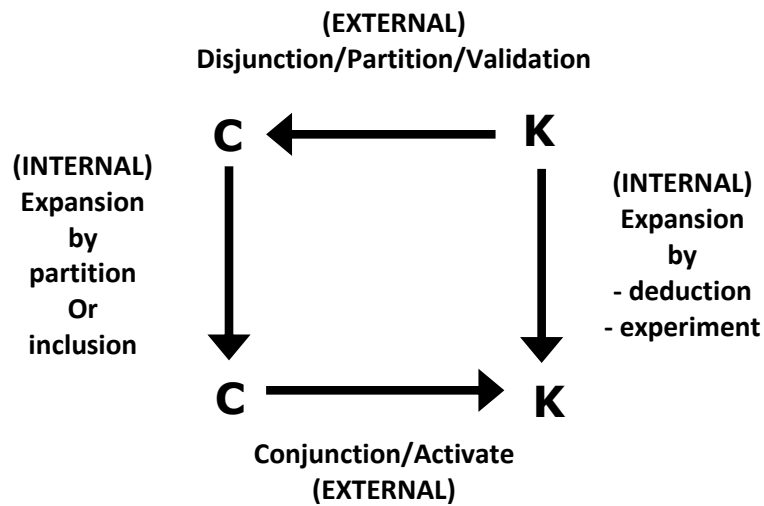


Figure 2.3: *The Concept-Knowledge Theory Design Square*
Source: Hatchuel & Weil (2003)

The external operators are $(C \rightarrow K)$ and $(K \rightarrow C)$ while the internal operators are $(C \rightarrow C)$ and $(K \rightarrow K)$. The $(C \rightarrow K)$ operator aims to broaden the available knowledge (K) in an enterprise, through concepts (C) developed in an organization's external environment. The operation comprises bringing together (conjunction) and activating existing concepts from outside the company to produce new knowledge for product design. The $(K \rightarrow C)$ operator enhances the concept space (C) in a firm by bringing in external knowledge (k) elements. The operation entails knowledge disjunction and validation for use in concept development. If not done carefully $(K \rightarrow C)$, it may result in 'imitation' since it may involve the use of previously proven market/product concepts (designs); in other words, fixation on current product ideas.

“C-K theory explains the fixation effect as arising from both a limitation of C and K expansions. Interestingly, the theory predicts that people tend to generate ideas

that are most accessible in memory. This activation of common knowledge could lead to fixation effects”

_ Agogu , et al. (2013. p. 3)

The internal operator ($C \rightarrow C$), denotes the partitioning or inclusion of existing internal concepts in developing new design concepts in the enterprise. This could be a typical approach for firms to create new and differentiated designs from internally existing concepts. The ($K \rightarrow K$) operator makes it possible for the knowledge space to self-expand. New internal knowledge in the enterprise is generated through deduction and experimentation with existing knowledge.

France (2017) referred to the C-space as the map of all possibilities while the K-space is the knowledge Library. In other words the C-space is “where you can imagine and explore new concepts”, while the K-space is a database of “knowledge you use or need to imagine or design new concepts”. Knowledge drives innovation and underpins the 'core competency' argument, which contends that enterprises must develop and manage their knowledge resources (Bessant, 2003). The C-K theory is thus a formal design theory that places creativity as a central part of its scope, where creativity is part of the process of generating new entities or variables. Shai, Reich, Hatchuel and Subrahmanian (2012) add to the design square narrative that both concepts and knowledge interact for effective creativity, with concepts relying on aspects from the nominal world while knowledge is from the logical/factual world (*Figure 2.4*).

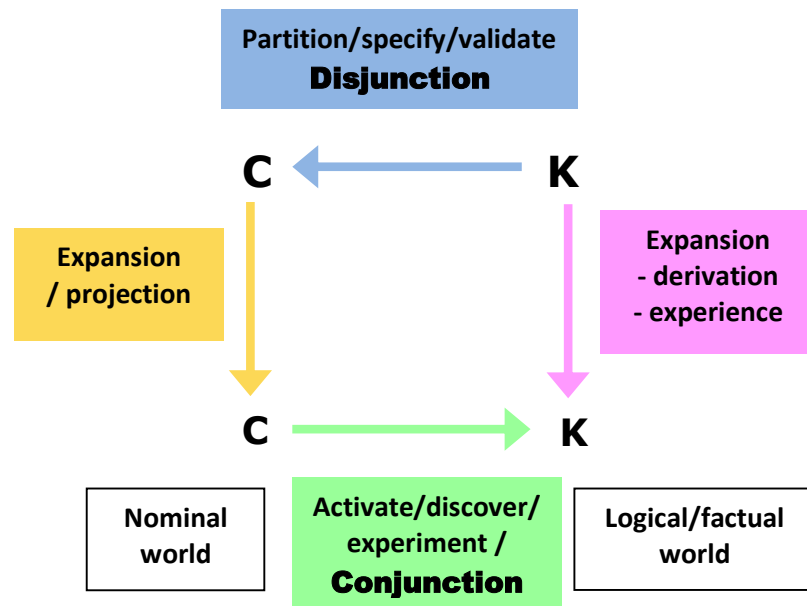


Figure 2.4: The Design Square Model of the C-K theory
 Source: Shai, Reich, Hatchuel, & Subrahmanian, 2012.

Other theories that corroborate the study theories selected include; the Investment Theory of Creativity (IToC), Self-Determination Theory (SDT), Theory of Creative Destruction (ToCD), and the Theory of Innovation. The Creative Stage Models (CSMS) that illustrate the new product design process are used together with the design theories to give a vivid understanding of NPD.

According to Bessant (2003), enterprises that produce and utilise their knowledge and expertise are more likely to establish and maintain a competitive advantage in their industry. For firm survival, Bessant emphasizes the importance of creativity and active learning. This suggests that textile MSEs must constantly update their knowledge and abilities in order to add value to existing products and develop new ones. This study also inquired into the role of concept and knowledge expansion as a design strategy amongst the textile MSEs.

2.4.3 Resource Based View Theory (RBV)

The resource-based view (RBV) is a business management theory popularised in the 1980s and 1990s by Birger Wernerfelt, Coimbatore Prahalad, Gary Hamel, and Jay Barney. Its origins can be traced back to Edith Penrose's works in 1959. The Resource-Based View (RBV) theory underlines the importance of a firm's internal resources and capabilities in maintaining an enterprise's competitive edge over time. Lubis (2022) states that a resource-based view (RBV) is an internal consideration that can be used to gain a competitive advantage. Enterprises must therefore be able to innovate in order to survive in a highly competitive environment. Innovation provides a system to improve enterprise performance by creating products that are valuable, uncommon, inimitable, and non-substitutable (VRIN). RBV can be applied to reinforce innovations, which are viewed as capabilities that influence enterprise performance in order to build lasting competitive advantage (Dushime et al., 2021; Rothaermel, 2012).

Resources can comprise both tangible assets such as physical capital and intangible assets like as knowledge, reputation, and brand equity. Textile MSEs manage resources such as financial resources, which are utilised to fuel the everyday work activity that encourages innovation. The other resource is human capital, which enables proper decision-making as well as successful planning and implementation of product design strategies. Knowledge-based resources are critical to an organization's performance and the effective implementation of PD strategies for innovation and market competitiveness. According to Kiveu (2017), enterprises with significant assets that are unique and hard to replicate can easily establish an enduring competitive edge in the form of innovative products.

2.4.4 Dynamic Capabilities Theory (DCT)

Dynamic Capabilities Theory (DCT) was pioneered by Teece, Pisano, and Shuen (1997) when they observed how organisations maintained or improved their competitiveness or performance in a dynamic and turbulent environment. Dynamic capabilities simply refer to capabilities of the firm which enable it to come up with innovative products and processes that meet changing market conditions (Dushime et al., 2021). The primary goal of dynamic capability is to make successful strategic judgements that impact business performance and achieve a sustainable competitive advantage (Muithya & Muathe, 2020). A textile MSE that takes a dynamic capabilities approach can modify its procedures and resources to develop the firm's value chain for long-term advantage.

2.5 Conceptual Framework of the Study

To remain competitive, enterprises may need to prioritize and apply successful product design strategies. Firms that focus on creativity and innovation are more able to sense and respond to market trends in a dynamic and diversified market, and hence continue in business. Product design ideas can come from creating in-house concepts and knowledge, as described in the C-K theory; nevertheless, most innovators require external inspiration to spark new ideas. Therefore understanding the market mix is critical not just for understanding the customer and learning from competitors, but also for adopting design strategies and technological know-how for incremental or radical innovation.

The distinction between one Textile MSE and another could be in the four (4) capabilities for planning, designing, producing, and marketing the product while being sensitive to political, economic, and social factors. The relation of these four (4) factors are illustrated and explained in Section 5.6: Proposed Product Design Strategy Guide. These activities were defined by Browning et al. (2006) as structured connected activities working to create a valuable product. Despite several challenges MSEs face, the study focused on the design challenge and therefore the design competency of the enterprise.

The conceptual framework for the study built from the theories CToC, C-K, RBV, and DCT is shown in Figure 2.5. The researcher's concept implies that new products (innovations) will come about due to creative and innovative processes, as supported by the CToC and C-K theories. The framework posits the constructs a Textile MSE needs to consider for effective performance. It illustrates a design perspective of the relationship between product design strategies and NPD performance.

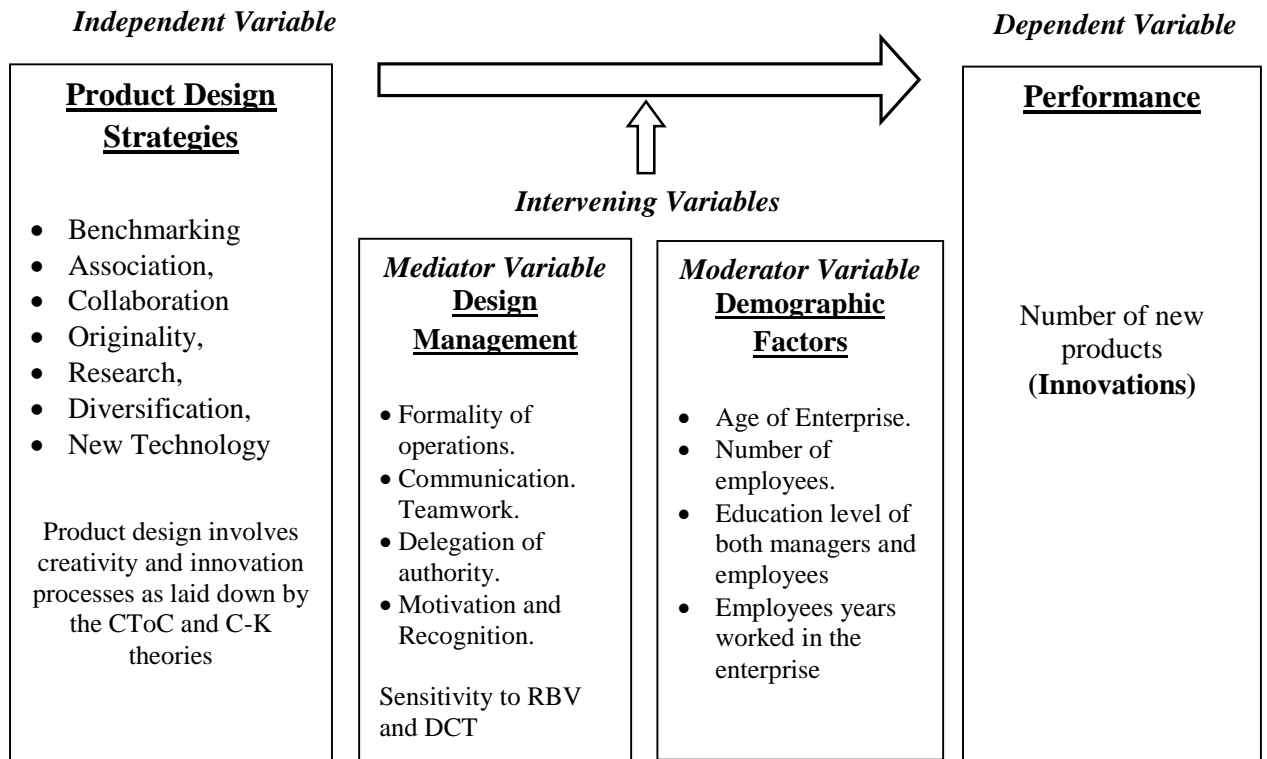


Figure 2.5: Product Design Strategy and Performance Concept

Source: Author, 2020

The independent variable in this study was the product design strategies. The dependent variable was performance in terms of creation of new products. This is usually assumed to be radical or incremental, arising from any of the four design situations; Renovate, Adapt, Evolve, and Discontinue. The intervening variables in the study were design management (Mediator) and demographic factors (Moderator). Design management was the mediator variable and the factors that were considered included; formality of operations, communication, teamwork, delegation of authority, motivation and recognition. It is worth noting that management knowledge (information, awareness, and understanding), management competency/efficiency (capability, ability, skill, expertise, proficiency) and environment appreciation (internal and external resources and situations) which plays a

crucial part in design management, and evidently product design process and innovation within a textile MSE. An intervening variable is a variable that influences the relationship between the independent and dependent variables. The design management (mediating variable) established and created the conditions for the application of design strategies (independent variable) to offer optimal performance (dependent variable, the output). The strength and direction of the relationship were controlled by demographic factors (intervening moderating variables).

CHAPTER THREE: METHODOLOGY

3.1 Introduction

The chapter describes the methods to be applied in carrying out the proposed research study in a systematic way. The components of the chapter are Research Design, Physical area, Target population, Sampling techniques, Sample size, Research instruments, Pilot survey, Validity and Reliability, Data collection method, Data Analysis method and Ethical consideration.

3.2 Research Design

The study aligned with the pragmatism philosophy, where ontology maintains that exterior "reality" is the practical result of ideas, with the possibility of developing new processes and practises. The epistemological viewpoint was that of the practical meaning of knowledge in specific theories; knowledge was defined as that which enabled successful action with an emphasis on problem-solving and informed future practise. The research method was deductive since causal linkages were used to test the hypothesis' validity. The research fieldwork strategy was a survey, and the methodological choice of analysis was quantitative. The research employed a combination of descriptive and explanatory research design. According to Kothari (2004), the objective of descriptive research studies is to reveal accurately the characteristics of a particular situation.

3.3 Physical Area

Nairobi City County has the highest literacy rate, at 87.1 per cent (KNBS, 2007). Nairobi also has the greatest number of adult learners, with 14,655 enrolled (KNBS 2021).

Therefore, very limited challenges in communication, understanding and filling of questionnaires were experienced.

The Nairobi central business district (CBD) is an urban area in Nairobi within the boundaries of the Uhuru highway to the west, the university way to the north, the Nairobi river to the north east, Haile Selassie avenue to the south and Race course road to the east.

(Appendix B)

3.4 Target Population

Textile MSEs within the Nairobi City County Central Business District (CBD) were selected for the survey. There was no official complete sample frame list of textile MSEs available. This necessitates the use of the purposive and snowball data gathering methods indicated in Section 3.5, as well as the selection of the sample size calculation given in Section 3.6. The enterprises were those engaged in the production of textile end-use items (consumer goods) rather than fibre, yarn, or chemical textile production. The businesses were those that had been in operation for more than three years and volunteered to take part in the study. The MSEs were contacted for permission to participate in the research study. Only enterprises that gave consent to the study request were included in the study. The respondents from the sample element were the manager and an employee.

3.5 Sampling Technique

The research study adopted a non-probability sampling method. The choice was attributed to the absence of a complete register for textile MSEs in Nairobi; also, as stated by Barreiro

and Albandoz (2001), “sometimes it is too expensive to make a complete list of all the elements of the population that need to be studied...” (p. 10). A probability sample is not needed in every research approach (Sarstedt, Bengart, Shaltoni, & Lehmann, 2018). Non probability sampling is used when there are challenges of obtaining a complete sampling frame. The research study used both purposive and snowball approach in identifying enterprises for the data collection.

Purposive sampling is a prominent method of non-probability sampling (also referred to as judgemental sampling) (Sarstedt et al., 2018). The strength of purposive sampling is that the method allows for selection of a sample case that best fits the required criteria, study driven variables or characteristics. Its drawback is that it involves collaboration from others to identify participants who fit the desired qualities. Due to the precise factors or traits required, it may take some time. (Valerio, Rodriguez, Winkler, Lopez, Dennison, Liang & Turner, 2016). This study used a criterion for sample case inclusion based on; (a) Operating in Nairobi City County, (b) A micro or small enterprise involved in textile product manufacture, (c) Having at least one employee, (d) Three or more years old (at the time of data collection). For each of the selected enterprises, one manager and two employees were purposively requested to participate in the study.

In snowball sampling, the selection relies on a referral approach. The strength of the method includes; (a) Reach to participants with same characteristics. (b) Often used in community engagement research studies and mixed methods approaches. (c) Based on networks and relationships that may lend credibility to research (Valerio et al., 2016). The limitations of snowballing according to Valerio et al. (2016) include; (a) Referral contact

may not be effective in identifying diverse individuals. (b) Referral contact may only identify participants meeting specific characteristics. (c) Participants may not share information freely for fear of breaching privacy or confidentiality. Managers from the identified enterprises that matched the criteria for inclusion in the study were respondents, who in turn recommended others enterprises that met the selection criteria. There were no incentives for making referrals and each zone had a predetermined number of enterprises targeted (Appendix B,)

3.6 Sample Size

Micro and Small enterprises producing textile end-products, such as fabrics and consumer textile products (apparel and other textile end-use products such as mats, bags, etc.), were targeted. The sample size was determined using a formula for an infinite population because an official comprehensive sample frame list of textile MSEs was not available. A formula for an infinite population was used to calculate the sample size (Kothari, 2004).

$$n = \frac{z^2 pq}{e^2}$$

Where:

n = the required sample size.

z= is the z value associated with the level of confidence required.

p = is the proportion belonging to the specified category

q = is the proportion not belonging to the specified category

e = is the margin of error required

Therefore:

n = the required sample size.

$z = 1.65$ (the z value associated with a 90% level of confidence) *

$p = 0.5$ (50%)

$q = (1-p) = (1 - 0.5)$

Allowing for a Margin of Error $\pm 6\%$ then it follows that:

$e = \text{MOE} = 0.06$ (since the estimate will be 6% to the true value)

Then:

$$n = \frac{z^2 pq}{e^2} \quad n = \frac{z^2 p(1-p)}{e^2} \quad n = \frac{z^2 p(1-p)}{\text{MOE}^2}$$

The Sample size calculation was done using an online sample size calculator available on the Statistics Kingdom website (Statskingdom 2018). The calculator provided a sample size of 188 for an infinite population.

The Sample size calculator (2018), calculation of the confidence interval (z) is 1.64

Where:

$P = 0.5$ with a MOE of ± 0.06 .

$\alpha = 1 - 0.90 / 2 = 0.050$.

$z = Z_{(1-\alpha)} = Z_{(1-0.050)} = Z_{0.950} = 1.64$.

Using

$$n = \frac{z^2 p(1-p)}{\text{MOE}^2} = z^2 * p(1-p) / \text{MOE}^2$$

Therefore the required sample size is:

$$\begin{aligned}n &= Z^2_{0.950} * p (1-p) / MOE^2 \\ &= 1.64^2 * 0.5(1-0.5) / 0.06^2 \\ &= 187.88. \\ &= \mathbf{188}.\end{aligned}$$

It is noted that the sample design and sample size were found to be appropriate in context of funds available for the research study. The results of the sample study can be applied, in general, for the population with a reasonable level of confidence, 90% with a margin of error of $\pm 6\%$

3.7 Research Instruments

The research instruments comprised two questionnaires (Appendix C & D). The questionnaires were administered to the Manager and employee (Face-to-Face method / In-person survey). The questionnaires were developed after extensive review of literature on the problem topic. The questionnaires comprised of mainly closed and a few open-ended questions designed to provide quantitative data to answer the research questions. Some of the question formats were derived / adapted from earlier studies, for example, Dionco-Adetayo and Adetayo (2004), Mahemba and De Bruijin, (2003), Ulrich and Eppinger, (2008), and Ambler, (2014).

3.7.1 Operationalisation and Measurement of Variables

The variables in the study were operationalised and measured as shown in Table 3.1. The independent variable in this study was the product design strategies. The dependent variable was performance in terms of creation of new products.

Table 3.1: Measurement and Operationalization of Study Variables

Variable	Nature	Operationalization	Measurement Criteria	Questions
Product Design Strategy	Independent variable	The strategies used by the enterprise, and to determine most used strategy	Nominal measurement	Section B1. Question 7
		The top product design strategies used, and ranking of the top three strategies.	Ordinal measurement.	
Performance	Dependant variable	Performance equated to the number of product innovations generated by the enterprise.		Section B2. Question 19
		Two Performance data sets used. Scale values: _ None, 1-3, 4-6, 7-9, 10 and more. Nominal (Dichotomous) _ Non-Innovative vs Innovative. Where 7 or more new products was innovative.		
Design Management	Intervening Variable. (Mediator)	Management and operational procedures that avail a conducive	Nominal measurement	Section B1. Question 8

		environment for creative work. Choices of values/position 1 to 6. with 1 as the most applied and 6 as the least applied		
Formality of Operations	Intervening Variable. (Mediator)	Having an organisational structure, including allocated roles, job instructions, and record keeping. The management approach and prioritization. Choices of values/position 1 to 6	Nominal measurement	Section B1. Question 8b
Communication	Intervening Variable. (Mediator)	Managing relationships with employees, customers, and other stakeholders requires effective communication. The management approach and prioritization. Choices of values/position 1 to 6	Nominal measurement.	Section B1. Question 8c
Teamwork	Intervening Variable. (Mediator)	Teamwork refers to the workforce's distinct contributions, true synergies, and creative approaches to enhancing productivity and learning. The management approach and prioritization. Choices of values/position 1 to 6	Nominal measurement.	Section B1. Question 8f

Delegation of authority	Intervening Variable. (Mediator)	Delegation of authority gives employees freedom in design conceptualization. The management is tolerant of mistakes and makes allowance for controlled risks, which is healthy for creativity and innovation. The management approach and prioritization. Choices of values/position 1 to 6	Nominal measurement.	Section B1. Question 8a
Recognition	Intervening Variable. (Mediator)	Recognition is associated with appreciation, which is a powerful employee motivator and fosters a culture of self-improvement. The management approach and prioritization. Choices of values/position 1 to 6	Nominal measurement.	Section B1. Question 8d
Motivation/Morale	Intervening Variable. (Mediator)	Motivation is essential for creativity and employee performance, impacting work morale and overall enterprise performance. The management approach and prioritization. Choices of values/position 1 to 6	Nominal measurement.	Section B1. Question 8e
Age of Enterprise	Intervening Variable. (Moderator)	Firm performance is moderated by age as businesses accumulate expertise and build on	Scale measurement	Section A1. Question 5

		previous routines, affecting innovation. Scale values;_10 or less, 11–20, 21–30, 31–40, 41+		
Number of employees	Intervening Variable. (Moderator)	Human resource capacity (number of employees) gives opportunity for intrapreneural activities and enhances the work environment.	Nominal measurement.	Section A1. Question 3
Education level of managers	Intervening Variable. (Moderator)	A good education fosters the development of skills, self-confidence, and other creative abilities. Selections are; Primary, Secondary, Diploma (A-level/College), University Bachelor, University Master and University Doctor	Ordinal measurement.	Section A1. Question 3
Education level of employees	Intervening Variable. (Moderator)	A good education fosters the development of skills, self-confidence, and other creative abilities. Value selections are; Primary, Secondary, Diploma (A-level/College), University Bachelor, University Master and University Doctor	Ordinal	Employee Questionnaire. Section A1. Question 1
Employees years worked in the enterprise	Intervening Variable. (Moderator)	Employee performance gradually improves as they gain experience over time. Five value choices;	Ordinal measurement.	Employee Questionnaire. Section A1. Question 3

		3 or less, 4–7, 8–11, 12–15 and 16 +		
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Source: Author.2023

3.8 Pilot Survey

The pilot survey testing was done to find out if the research questionnaire would be suitable for the final study by administering it on a few enterprises. It assisted the identification of possible data collection errors and biases. Apart from data collection, data analysis was done to identify and address issues that could arise during the main survey. The pilot survey was a critical exercise for the content validity analysis of the research questionnaire, where assessment included readability, clarity and comprehensiveness, to determine which items would be included in the final instrument.

The pilot survey process involved a Multi-Stage sampling; the stages were; (a) The first stage was the sub-county selection, here Roysambu Sub-county division was purposively selected as a geographically distinct cluster. (b) The second stage was ward selection; Out of the 5 wards, Kahawa-west and Roysambu wards were conveniently selected to represent the textile MSEs of Roysambu Sub-county enterprises. (c) The third strata/stage was the selection of textile MSEs within the ward; they were identified using snowball approach. (d) The fourth and final stage was the selection of the respondents within the sample units. Managers and employees were purposively selected as respondents. A sample size of 14 textile MSEs was used for the pilot study and can be accepted as a representative number, as Saunders, Lewis and Thornhill (2000) recommend a minimum of 10 respondents. According to Baker (1988), the size of a sample used for pilot testing varies based on time,

cost, and feasibility, but the same would likely to be 5-10% of the sample. According to Cooper and Schindler (2006), when testing the validity and reliability of instruments, respondents in a pilot test do not need to be statistically selected.

The pilot survey was to determine possible ambiguities in some of the questions. The questionnaire also elicited the type of data to anticipate, and whether the questions asked would be understood without communication challenges. The questionnaire was then rephrased and reorganized to avoid random and systematic errors during the primary data collection. The reliability threshold was determined using Cronbach Alpha with an acceptable reliability coefficient of 0.70 or higher. The pilot survey was carried out on selected textile MSEs that were eventually excluded from the final study.

3.9 Validity and Reliability of Instruments done in the Pilot Study

Validity and reliability are concepts for ensuring credibility in a research study. The certainty that the instrument will measure as intended is referred to as validity, whereas reliability is concerned with the instrument's ability to measure consistently (Bajpai & Bajpai, 2014; Tavakol & Dennick, 2011). Validity and reliability analysis are important because instrumentation should be able to obtain quality research data (Bajpai & Bajpai, 2014). The selection of measurement processes generated from reviewed literature from related studies, as well as supervisor consultation, contributed to the research's credibility. Supervisors also verified the sampling method, data collection instruments and measurement tests/procedures. This was to ensure that the chosen measurements and assessment approaches were suitable for the study. Construct validity was attained through

assuring the relevance of both secondary sources of information, as well as the clarity and unambiguity of the study's questions. The questionnaires were hand delivered allowing for the respondents' clarifications to be addressed promptly. Training sessions with research assistants before the data collection stage made the study more credible

A reliable study is one whose measuring procedures can be replicated to yield similar results. Reliability mainly refers to internal consistency of a research instrument. Internal consistency needs to be determined (after pilot survey) before carrying out research to ensure validity (Tavakol & Dennick, 2011), or after a research study to show suitability and prove that the tool can be replicated in another study. The reliability test of internal consistency formula 'Alpha' was named Cronbach after the name of the developer Lee Cronbach in 1951 (Tavakol & Dennick, 2011).

According to Cooper and Schindler (2003), Cronbach alpha is the ideal method for measuring multi-item scales at the interval level since it only takes one administration that provides a unique, quantifiable indication of the scale's internal consistency. The same procedure is also used to describe the reliability of the research instrument. When the factors are extracted from dichotomous measurements it is referred to as the Kuder-Richardson (KR-20) test. Alpha coefficient ranges in value from 0 to 1; the higher the score, the more reliable the question items. The acceptable cut-off score was 0.7 as guided by the evaluation chart in Table 3.1.

Table 3.2: Cronbach Alpha Evaluation Chart

Rating of Internal Consistency of Cronbach Alpha

Cronbach Alpha Value	Internal Consistency
$\alpha \geq 0.9$	Excellent
$0.9 > \alpha \geq 0.8$	Good
$0.8 > \alpha \geq 0.7$	Acceptable
$0.7 > \alpha \geq 0.6$	Questionable
$0.6 > \alpha \geq 0.5$	Poor
$0.5 > \alpha$	Unacceptable

Source: Stephanie Glen. (2014).

<https://www.statisticshowto.com/probability-and-statistics/statistics-definitions/cronbachs-alpha-spss/>

This research selected items from the Manager’s and Employee’s questionnaires and tested for reliability using the Cronbach Alpha test and the Kuder-Richardson Test. Cronbach Alpha and Kuder Richardson (KR-20) tests have the same procedure and cut- off point. The difference between them is that Cronbach is a reliability analysis on Scale questionnaire tool items, while KR-20 is for a reliability analysis on dichotomous questionnaire tool items. Tavakol and Dennick (2011) present the Cronbach Alpha formula as:

$$\alpha = \frac{N \cdot \bar{c}}{\bar{v} + (N - 1) \cdot \bar{c}}$$

Where:

α = scale reliability for internal consistency

N = the number of items,

\bar{c} = average covariance between item-pairs, (the average inter-item covariance among the items)

\bar{v} = average variance.

The Statistical Package for Social Sciences (SPSS) version 20 computer programme was used to calculate the reliability analysis of the pilot survey questionnaires (Appendix E). The result for the pilot survey managers questionnaire was an 'acceptable internal consistency' at $\alpha = .753$ (KR-20) while that of the employees questionnaire was a 'good internal consistency' at $\alpha = .824$. To increase the validity and accuracy of the instrument to be used in the final survey, the unreliable questions were changed. If the questions were found to be inconsequential, they were either modified or eliminated.

3.10 Data Collection Method

The In-Person survey data collection approach was used, with a questionnaire handed out in person to textile MSE managers and employees. The majority of the questions were closed-ended, with only a few exceptions. The questionnaires and responses were coded in preparation for analysis using the SPSS tool. Primary data was collected from managers of selected textile MSEs using questionnaires. The researcher was able to obtain information from the managers about the independent variables and dependent variable (Product Design Strategies and Performance respectively). Employees were questioned to see if they work in an environment that encourages creativity and innovation. Secondary data was collected from books, journals, magazines, newspapers and internet sources. The primary data collection technique was in the realm of descriptive survey methods and used questionnaires. Kombo and Tromp (2006) write that descriptive survey method uses interviews or questionnaire to obtain information from a sample of individuals.

Prior to fieldwork and data collection, one day training for the data collection assistants was held. The purpose of the training was to assign the field data collection assistants their tasks, but more so to impress on them the extremely important role they were to play for the success of the survey. The data collection assistants needed to know their roles which included to: (a) Being knowledgeable about the survey. (b) Being able to communicate this information effectively to respondents. (c) Maintaining the highest ethical standards. (d) Collecting data with objectivity and treating all of the information observed or gathered with complete confidentiality. (e) Following all questionnaire administration procedures. The training topics included: (a) Professional ethics and respondents' rights, (b) Importance of confidentiality, (c) Performance expectations, (d) Scheduling fieldwork and planning routes, (e) Assembling and safe keeping of field materials, and (f) Establishing rapport. The training session introduced the data collection assistants to the study and assigned their data collection zones (Appendix B). While in the field the assistants had to have the following field materials; statement of confidentiality/official introduction letter, consent forms, questionnaires, pens and field supervisor contact information.

3.11 Data Analysis Method

The data analysis method used was the statistical analysis method through a process of; collection, analysis, presentation and interpretation of data. The process comprised descriptive analysis and inferential analysis. In the descriptive analysis, numerical data was summarized into mean and deviation for continuous data, whereas for categorical data, the numerical data was summarized into percentages and frequencies. The obtained data was first prepared (coded and screened for errors), then explored and displayed in Tables and

graphs (to show measures of central tendency) and finally relations between the variables were explored. Statistical models used included measures of central tendency. The Statistical Package for Social Scientists (SPSS) software, version 29 was used to generate variable measures and to test the hypotheses.

The data presentation and analysis sequence was divided into the following sections; demographic data analysis, product design strategy data analysis, product design performance data, influence of product design strategies on the performance of textile MSES, and, product design self-assessment. Chi-square “Goodness of Fit Test” test was used to measure the variation in the type of product design strategies used by the enterprises. The Chi-square “Goodness of Fit-Test” test was also used to determine the variation of Product innovation output. To test the influence of the strategies on the performance a Multiple Logistic Regression test was used to establish the influence of the independent variables on the dependent variable. The General Linear Model (GLM) univariate analysis of variance (UNIANOVA) was done to determine the relationship between the independent variables and the dependent variable.

3.12 Ethical considerations

The ethical issues considered included: (a) the field study was only done after approval from the Graduate School of Kenyatta University. (b) a research permit was acquired from the National Council of Science and Technology. (c) Consent to participate in the study was received by the firms. No respondent was coerced to offer information. (d) Respondents’ identity was kept confidential. (f) Psychological harm on respondents was

avoided. (g) The data collection and analysis of the study was done as accurately as possible. (h) Proper citation and acknowledgement of references used in the research was done. (i) Once completed, the research was well documented in accordance with the university format. (j) Upon completion the research findings will be available to the stakeholders in the textile sector, to the government and to the university and public at large through publications, seminars, workshops and conferences.

CHAPTER FOUR: DATA PRESENTATION AND ANALYSIS

4.1 Introduction

This Chapter presents then analyses the study data. The data analysis is divided into the following sections; Demographic Data Analysis, Product Design Data Analysis, Product Design Performance Data Analysis, Managers Innovation Orientation Data Analysis and Inferential Statistics sections focusing on data to answer the research questions for objectives 1, objective 2 and objective 3. The chapter presents data collected from Nairobi textile MSEs. The study had 188 participants, with 153 responding, giving an 81% response rate. The data in the chapter is presented as a descriptive narration of the frequencies and percentages of the variables; these are visually presented as data Tables or figures.

4.2 Response Rate

The response rate is a data summary measure often used as an indicator for survey quality (RISQ - Representative Indicators for Survey Quality - Cathie Marsh Institute for Social Research (CMI) – (Groves et al., 2004; CMI, 2020,). Quality assurance approaches procedures have been prioritized for survey research teams. Bedirhan Üstun et al. (n.d.) state that response rate is one of the appropriate indicators used to report the quality assurance process of a survey in quantitative terms. Lindemann (2019) writes that the In-person (Face-to-Face) survey is the most effective survey method and notes that it allows for the most personalized experience. Table 4.1 indicates the response rates of five popular survey methods.

Table 4.1:
Survey Average Response Rates

	Survey Method	Average Response Rate
1	In-Person Survey	57%.
2	Mail Survey	50%.
3	Email Survey	30%.
4	Online Survey	29%
5	Phone Survey	18%

Source: Lindemann (2019). <https://surveyanyplace.com/average-survey-response-rate/>

A higher response rate is preferable (Altman & Bland, 2007). A nonresponse sampling bias referred to as a "Participation bias" results from a low response rate. In participation bias, the sample is non-representative and systematically different from the target population (Fowler, 2009). The response rate of a survey is determined by dividing the number of people interviewed by the total number of people in the sample who were eligible to participate (AAPOR, 2019). This study computed the estimated survey response rate using the formula sourced from Petroni et al. (2004). The result was a high response rate of 81%

$$RR = R / M$$

Where:

RR = Response rate

R = the number of units that provide a response, and

M = the number of units for which one attempts to obtain a response.

Therefore:

$$\begin{aligned}\text{Response rate} &= R / M \\ &= 153 / 188 \\ &= 0.813\end{aligned}$$

$$\begin{aligned}\text{Response rate (\%)} &= 0.813 \times 100 \\ &= 81.3\% \\ &= 81\%\end{aligned}$$

4.3 Demographic Factors Analysis

The characteristics of the textile MSEs and the respondents were an important preamble to the study. The section presents the descriptive statistics of the characteristics of the respondents and the textile MSEs studied. The selected characteristics of interest were; Age of Enterprise, Number of employees, Education level of managers and employees, and Employees years worked in the enterprise.

4.3.1 Age of Enterprise

The enterprise age was collected to understand the demographic factor's intervening role in the relation between PD strategies and PD Performance. The ages of the textile MSEs were collected and put into five age categories, as indicated in Figure 4.1

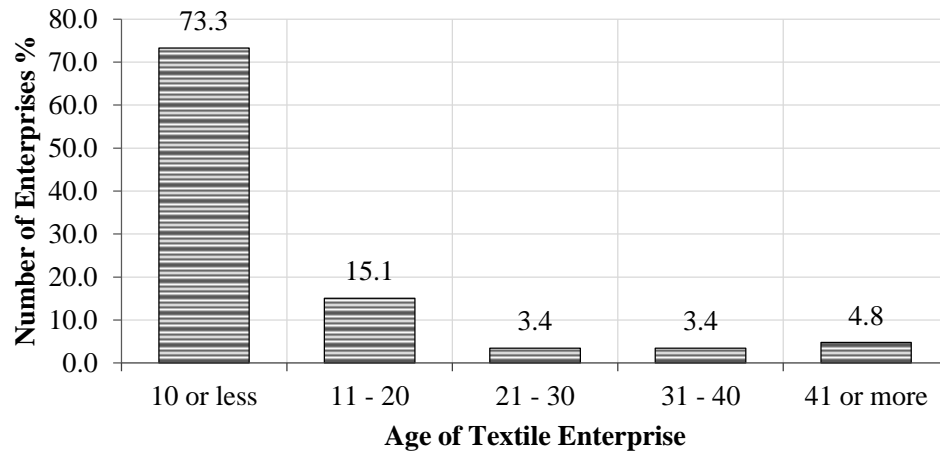


Figure 4.1: Age of Textile Enterprise

Source: Survey data. 2020

Majority 107 (73.3%) of the enterprises in the study had less than 10 years of operations, Minority 5 (3.4%) of the respondents indicated that their enterprises were between 21 years and 30 years; likewise, 3.4% of the respondents indicated that their enterprises were between 31 years and 40 years.

4.3.2 Number of Employees in the Enterprise

The number of employees in the enterprise was recorded to understand the demographic factor's intervening role in the relation between PD strategies and PD Performance. The employee numbers were collected for two years and put into five categories, as indicated in Figure 4.2

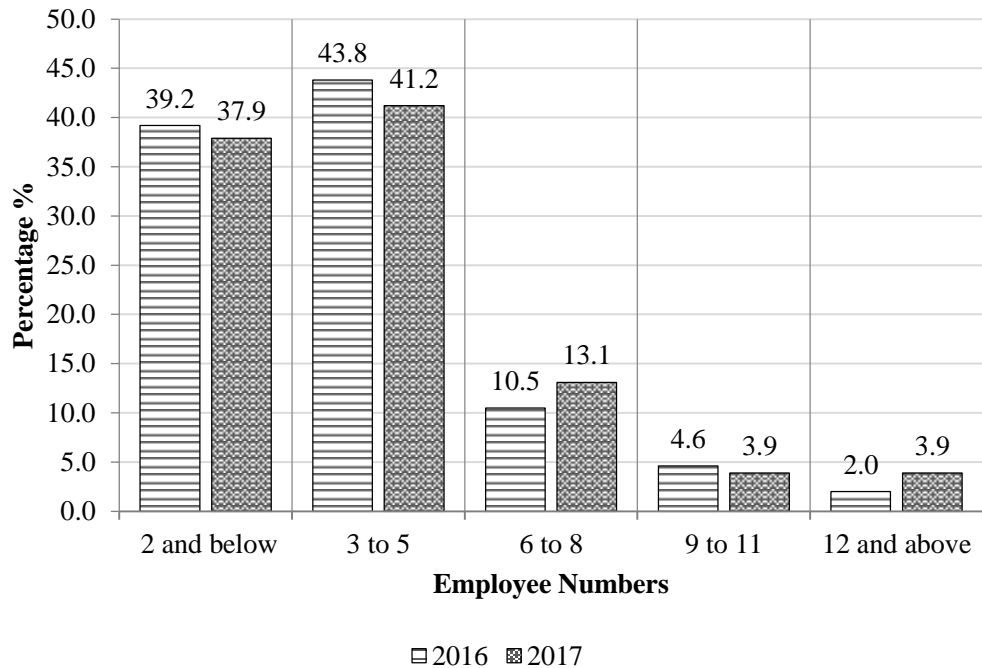


Figure 4.2: Number of Employees in the Enterprise

Source: Survey data. 2020

In 2016, majority 67 (43.8%) of the enterprises had three to five employees; in 2017, majority 63 (41.2%) of the enterprises had three to five employees. Only 3 (2%) and 6 (3.9%) of the enterprises had 12 or more employees in 2016 and 2017 respectively.

4.3.3 Highest Education level of Manager and Employees

The highest education level of managers and employees in the enterprise were recorded to understand the demographic factor’s intervening role in the relation between PD strategies and PD Performance. The education levels were collected and put into five categories, as indicated in Table 4.2 and Table 4.3

Table 4.2: Education Level of Manager

Education Level	Frequency	%
Primary	22	14.7
Secondary	43	28.7
Diploma (A-level/College)	59	39.3
University Bachelors	24	16.0
University Masters	2	1.3
Total (n)	150	100.0

Source: Survey data. 2020

The manager respondents were asked to indicate their highest education level. Majority 59 (39.3%) of the Managers had a diploma.

Table 4.3: Employee Education Level

Education Level	Frequency	%
Primary	44	30.3
Secondary	56	38.6
Diploma	35	24.1
University Bachelors	10	6.9
Total (n)	145	100.0

Source: Survey data. 2020

The enterprise employees indicated their highest level of education attained. The majority 56 (38.6%) of the respondents had attained secondary education, and only 10 (6.9%) had university bachelors' level of education.

4.3.4 Years Worked in the Enterprise

The employees number of years worked in the enterprise were recorded to understand the demographic factor's intervening role in the relation between PD strategies and PD Performance. The data was collected and put into five categories, as indicated in Figure 4.3.

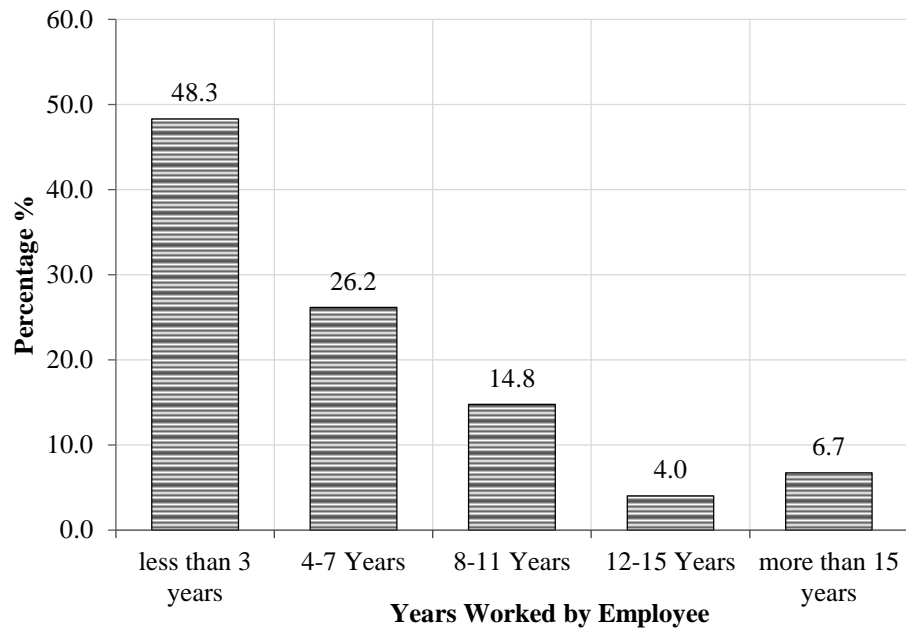


Figure 4.3 : Years Worked by Employee

Source: Survey data 2020

The results indicated that 72 (48.3%) of the employee respondents had worked in the enterprises for less than 3 years. Six (4%) respondents had worked for between 12 to 15 years.

4.4 Descriptive Analysis

4.4.1 Product Design Strategies Analysis

The first objective of the research was to explain the product design strategies used by MSEs in the textile sub-sector. The following null hypothesis was presented:

H₀₁ There is no significant variation in the type of product design strategies used by the textile MSEs in Nairobi City County, Kenya.

This section presents data to answer the research question: What product design strategies are employed by the textile MSEs? It not only presents the descriptive statistics of the Product design and development strategies, but also the design management strategies including design decisions, knowledge and skill upgrade consideration, product design and innovation approach. These other variables are important because design strategies will deliver when employed within a conducive enterprise environment. The subsections will be the test for analysis, the product design and development strategies and other factors to consider in the product design process.

4.4.1.1 Utilization of Product Design Strategies

A nonparametric legacy Chi-square test using SSP Version 29 was used to analyse the variation in the use of product design strategies by the textile MSEs. The specific Chi-square test measure used for the hypotheses was the “*Goodness of Fit*” test model as illustrated:

$$X^2 = \sum \frac{(o - e)^2}{e}$$

Where

o = observed frequency

e = expected frequency

If χ^2 (*calculated*) > χ^2 (*tabulated*), with (n-1) df, then null hypothesis is rejected otherwise accepted.

And if null hypothesis is accepted then it can be concluded that the given distribution follows theoretical distribution.

The assumptions made in order to accurately evaluate the result of the chi-square goodness of fit analysis test, and arrive at a reliable interpretation based on its results, are:

1. Observations being tested are independent of each other.
2. Collected data is representative and the results can be generalized to the population being studied.
3. Reasonably high cell frequencies are anticipated.
4. There are variations in data frequencies or counts within established categories.
5. The categories are independent and mutually exclusive.

The test was used to determine whether observed sample frequencies (oi) differ significantly from expected frequencies of the studied variable as specified in the null hypothesis. . The expected frequency counts (ei) at each level of the categorical variable are equal to the sample size (n=153) times the hypothesized proportion (1/2). The test statistic is a chi-square variable (χ^2). Other statistics to note are; the asymptotic significance, degrees of freedom (df) and the p-value. A 90% confidential interval was employed for a p-value of .10. The degrees of freedom (DF) is equal to the number of levels (k) of the categorical variable minus 1 (df = k – 1). The p-value is the probability of observing a sample statistic as extreme as the test statistic. (Stat Trek, 2019).

To verify the reliability of the chi-square test results, a Monte Carlo Simulation (MCS) test was performed using SPSS version 29. The MCS is an analytical method for determining the potential outcomes of an uncertain situation. According to IBM (2021a), when data fails to meet the assumptions required for reliable results, while using the traditional asymptotic method, then MCS is recommended to provide accurate results. In the context of Chi-square tests, MCS generates multiple random datasets based on the null hypothesis and compares them to the observed dataset. The ‘Test Statistics section’ in Table 4.4 show the MCS chi-square values from 153 respondents with a 90% confidence level. The findings are discussed in Chapter 5, Section 5.3.

Table 4.4: Product Design Strategies Used: Chi-Square Test Results

Test Frequencies				
Strategy		Observed*	Expected	Residual
Benchmarking	Yes	83	76.5	6.5
	No	70	76.5	-6.5
Association	Yes	16	76.5	-60.5
	No	137	76.5	60.5
Collaboration	Yes	34	76.5	-42.5
	No	119	76.5	42.5
Originality	Yes	78	76.5	1.5
	No	75	76.5	-1.5
Research	Yes	71	76.5	-5.5
	No	82	76.5	5.5
Diversification	Yes	58	76.5	-18.5
	No	95	76.5	18.5
New technology	Yes	77	76.5	.5
	No	76	76.5	-.5

* The total frequency for each strategy variable was 153.

Source: Survey data. 2020

Test Statistics

	Benchmarking Strategy	Association Strategy	Collaboration Strategy	Original Strategy	Research Strategy	Diversification Strategy	New Technology Strategy
Chi-Square	1.105 ^a	95.693 ^a	47.222 ^a	.059 ^a	.791 ^a	8.948 ^a	.007 ^a
df	1	1	1	1	1	1	1
Asymp. Sig.	.293	<.001	<.001	.808	.374	.003	.936
Monte Carlo Sig	.320^b	<.001^b	<.001^b	.869^b	.412^b	.007^b	1.000^b
90% Confidence Interval							
Lower Bound	.258	.000	.000	.824	.346	.000	.985
Upper Bound	.382	.015	.015	.914	.477	.017	1.000

a. 0 cells (0.0%) have expected frequencies less than 5. The minimum expected cell frequency is 76.5.

b. Based on 153 sampled tables with starting seed 1597675572.

Source: Survey data. 2020

4.4.1.2 Product Design and Development Strategies

Research respondents were asked to indicate the Product Design strategies they use by ticking and ordering their top ‘three out of seven’ provided strategies. The strategies were Benchmarking, Association, Collaboration, Originality, Research, Diversification, and New Technology. The percentages were calculated for the strategies. As indicated in Figure 4.4.

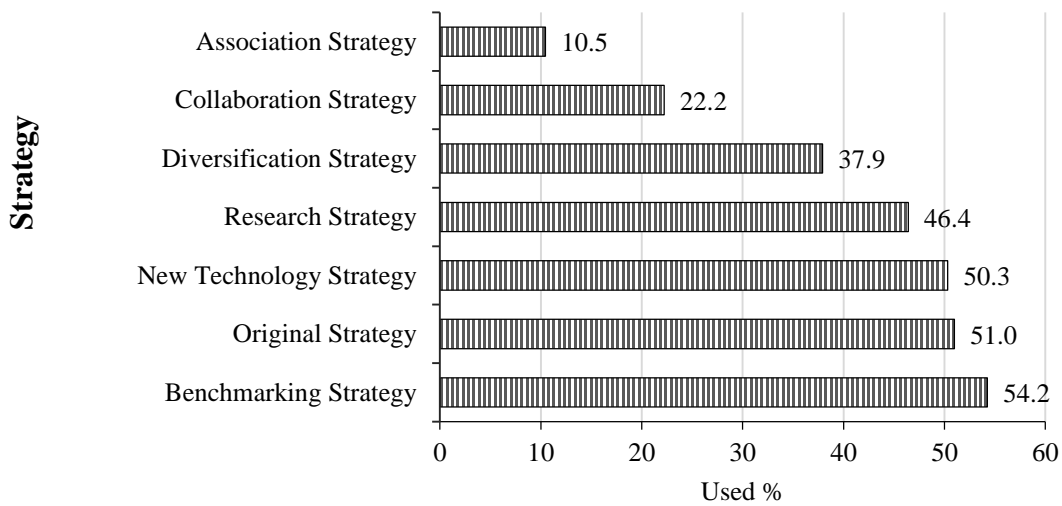


Figure 4.4: Product Design and Development Strategies

Source: Survey data 2020

The most employed strategy from the selection tally was Benchmarking at 54.2% supported by 83 votes. This was followed by Original strategy and New Technology strategy with 78 (51%) and 77 (50.3%) votes respectively. The least used strategy was Association Strategy with 16 (10.5%) votes. Table 4.4 indicates the data for the preferred strategies that were used and the priority of the strategies, selected for the 1st category preference, 2nd category preference, and 3rd category preference.

Table 4.5: Priority of Product Design and Development Strategies

Design Strategy	Priority (%)		
	1st	2nd	3rd
Benchmarking Strategy	55.6	20.4	24.1
Association Strategy	44.4	33.3	22.2
Collaboration Strategy	40.0	33.3	26.7
Original Strategy	38.6	29.5	31.8
Research Strategy	28.6	49.0	22.4
Diversification Strategy	26.5	38.2	35.3
New Technology Strategy	20.4	27.8	51.9

Source: Survey data. 2020

Benchmarking was the preferred strategy in the first (1st) category with 55.6%, referring to comparison with outstanding performers in the same trade. Research activities and New Technology were the preferred strategies in the second (2nd) and third (3rd) categories, with 49.0% and 51.9%, respectively.

4.4.1.3 Some Other Factors to consider in Product Design Process

The following sub-section presents data of indicators that could give reasons for the enterprises preferred Product Design Strategy. The attributes studied were; Innovation Orientation, Product Design Approach, Design Management Process, Design Decision Making, Design knowledge and, Design skill upgrade. Data on the mentioned factors are indicated in Table 4.6.

Table 4.6: Enterprises' Assessment of their Product Design Process

Enterprise Product Design Process Assessment		
Design Factors	Product Design Process status	Percentage
Innovation Orientation	Enterprises always created products to meet the needs of particular type of customer (Concentrated Application)	64.8%
Product Design Approach	Enterprises always modified existing products by adapting technology trends (Adapt innovation approach)	42.0%
Design Management Process	Recognition of employees success was the most selected in the design management process action	78.4%
Design Decision-making	The customer made the decision on the product designs.	41.0%
Designs Source/Origination	The customer was the source of the design idea	85.6%
Design Knowledge	Manager and Employees were encouraged to 'acquire product design knowledge'.	62.8%
	Manager and Employees were encouraged to 'share design knowledge within the enterprise'.	67.2%
	Manager and Employees were encouraged to 'source for designs concepts from outside the enterprise'.	61.5%
Design Skill Upgrade	Manager and the employees were encouraged to "keep their design skills up to date".	63.9%
	Acquiring skilled personnel and improving in-house skills were important, for Design skill upgrade in the enterprise.	94.0%
Customer and Competitor Orientation	Enterprise always acquired customer information to improve the product design and production,	65.0 %
	Enterprise always had adequate information about customers.	65.0%
	Enterprise always had adequate information about competitors	43.0%
Process Chain of Product Design Work	Consumer Requirement (customer brings or selects design) → Product creation.	91.9%

Source: Survey data. 2020

4.4.1.3.1 Innovation Orientation.

The purpose (the orientation) of the creation is summarized in this section. The four innovation orientation categories are; Design Prominence, Feature Leadership, Concentrated Application and Desirable Alternative. ‘Design Prominence’ was determined by establishing whether they created products that stand out through presentation and innovative material. ‘Feature Leadership’ was determined by inquiring whether they created product designs that are new and ahead of other existing products. ‘Concentrated Application’ was established by finding out whether their products were created to meet the needs of particular type of customer. Finally, ‘Desirable Alternative’ was determined by finding out whether they created a desirable alternative to existing products. The data on the innovation orientation approach revealed the strategy the textile MSEs prioritized. This is indicated in Figure 4.5.

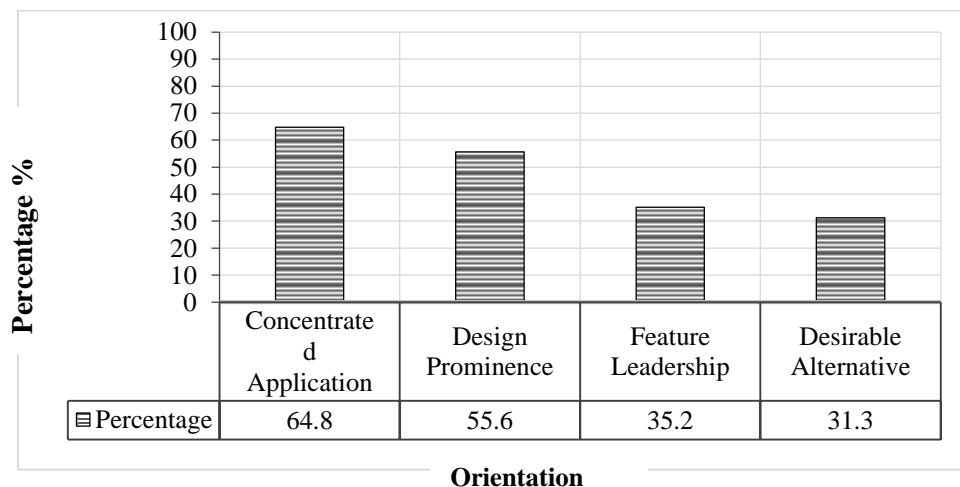


Figure 4.5: Innovation Orientation Most Frequently Used

Source: Survey data 2020

Most enterprises 94 (64.8%) always created products to meet the needs of a particular type of customer (Concentrated Application). This was closely followed by 84 (55.6%) who create for Design prominence.

4.4.1.3.2 Product Design Approach.

The technical way a textile MSE's creation was carried out (the approach) summarizes the different innovation types. Data on how often the enterprises followed a product design approach was collected for four innovation approach categories; Renovate_ where existing products are modified through minor changes. Adapt _ where existing products are modified by adapting Technology trends. Evolve _ where new products are created by adapting existing Technology and Discontinue _ where totally new products not similar to any in the market are created. The results of the data collection are visualized in Figure 4.6.

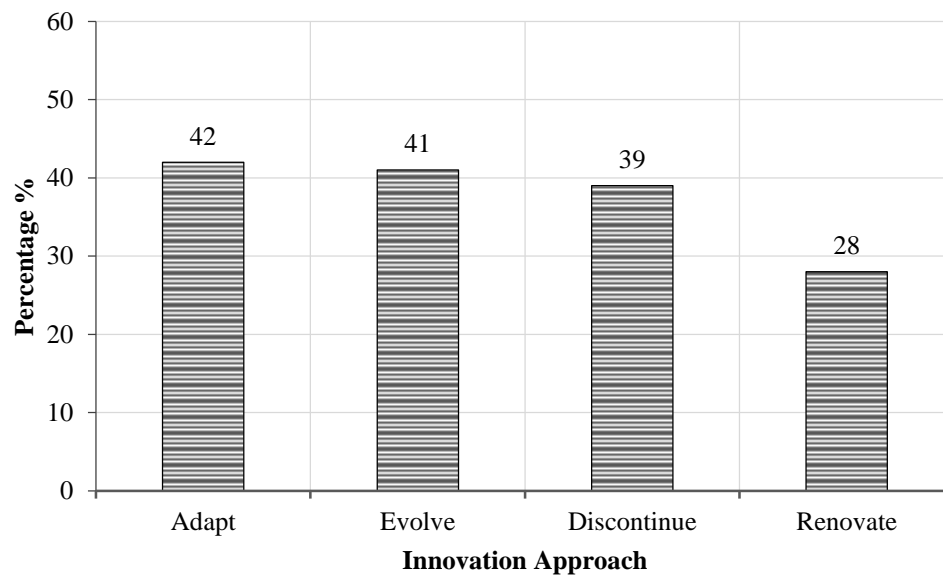


Figure 4.6: Enterprise's Design / Innovation Approach

Source: Survey data 2020

Most enterprises 63 (42%) always modify existing products by adapting technology trends (Adapt innovation approach). This was closely followed by 62 (41%) who always create new products by adapting existing Technology (Evolve innovation approach). The product design approaches of Adapt, Evolve and Discontinue were selected by almost a similar

number of enterprises. The least prioritized approach was Renovate at 28% supported by 41 textile MSEs

4.4.1.3.3 Design Management Process.

In small enterprises, individuals, mainly the leader, make most of the key decisions in the innovation process. The leader can be very direct and pervasive in the organizations innovation approach (Vagnani & Volpe 2017). Furthermore, the manager or owner plays a critical role in providing an enabling environment for the product design process.

To find out the popular use of the product design variables, the Manager respondents were asked to rank their preferred variable out of six given variables. Table 4.7 indicates how the management strategies were prioritized.

Table 4.7: Preferred Design Management Factors

	Variables	Frequency	Percentage	Mean	Std Deviation	Rank
1	Recognition	120	78.4	1.22	0.413	1
2	Motivation	119	77.8	1.22	0.413	1
3	Teamwork	119	77.8	1.22	0.417	1
4	Communication	118	77.1	1.23	0.421	2
5	Formality	116	75.8	1.24	0.43	3
6	Delegation	113	73.9	1.26	0.441	4

Source: Survey data 2020

The respondents' first (1st) ranked management choice strategies were Recognition, Motivation and Teamwork. The three variables had relatively similar measures of 78.4%, 77.8% and 77.8% supported by 120, 119 and 119 Textile MSEs respectively. Communication strategy was preferred as the second (2nd) ranked management choice strategy at 77.1%, supported by 118 respondents. Formality strategy was preferred as the

third (3rd) ranked management choice strategy at 75.8%, supported by 116 respondents. Delegation strategy was preferred as the fourth (4th) ranked management choice strategy at 73.9%, supported by 113 respondents.

4.4.1.3.4 Design Decision-making.

The respondents were asked to indicate the person who decides on the design to be implemented. Figure 4.7 below shows the textile MSEs' response:

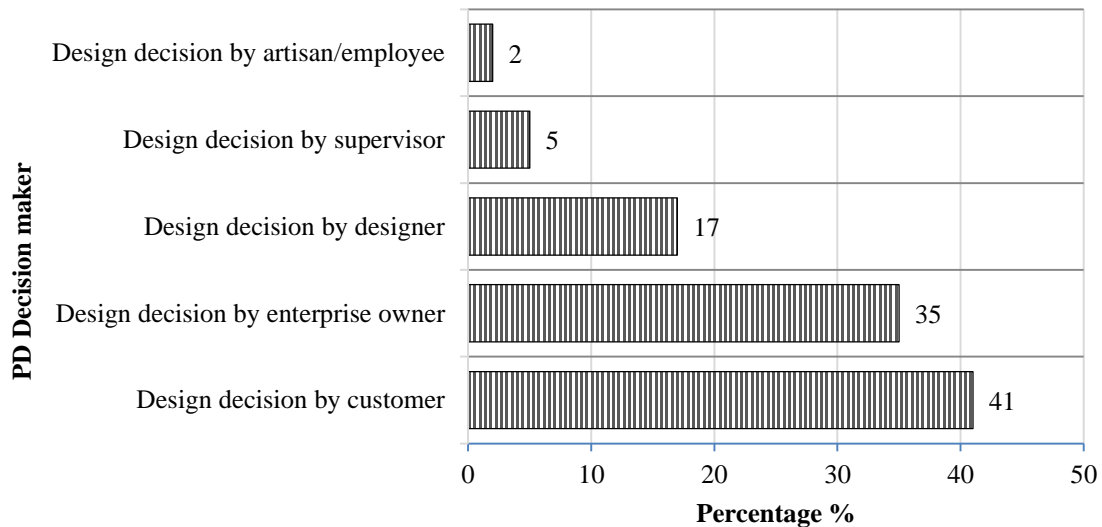


Figure 4.7: Design Decision-making
Source: Survey data 2020

One hundred and sixteen (116) that is 41% of the respondents said the customer decided on the designs, 35% supported by 100 respondents said that the owners decided on the designs, 17% supported by 49 respondents indicated that designers decided on the designs, 5% supported by 13 respondents said that the supervisor decided on the designs, while 2% supported by 6 respondents said that artisans decided on the product designs.

4.4.1.3.5 Designs Source/Origination.

Four design sources were gauged; customers, internal concepts, competitors and Literature.

One hundred and fifty three (153) Textile MSEs gave responses, as indicated in Table 4.8.

Table 4.8: Design Origination and Idealisation

Source	N	Frequency	%
Customers	153	131	85.6
Internal concepts	153	69	45.1
Competitors	153	37	24.2
Literature	153	22	14.4

Source: Survey data. 2020

Customers were indicated as a source of design idealization by the majority (85.6%) supported by 131 respondents. Literature which includes publications and internet (plus social media) was the least used at 14.4 %,

4.4.1.3.6 Design Knowledge.

The manager respondents were asked to give information about knowledge management within their enterprise. The questions included whether both the Manager and the Employees Acquire product design knowledge; Share design knowledge within the enterprise and whether they are encouraged to source for designs concepts from outside.

On the question of encouragement to ‘acquire product design knowledge’, a majority sixty two point eight (62.8%) managers indicated that both they and the employees were encouraged to ‘acquire product design knowledge’. Twenty two point five per cent (22.5%) indicted that they were encouraged to ‘acquire product design knowledge’; while

14.5% managers said they encouraged their employees to acquire product design knowledge.

On the question of encouragement to ‘share design knowledge within the enterprise’, a majority sixty seven point two (67.2%) managers indicated that both they and the employees were encouraged to ‘share design knowledge within the enterprise’. Eighteen point three per cent (18.3%) of the managers indicated that they were encouraged, while 14.5% of the managers said they encouraged their employees to share design knowledge within the enterprise’.

On the question of encouragement to ‘source for designs concepts from outside’, a majority sixty one point five (61.5%) managers indicated that both they and the employees were encouraged to ‘source for designs concepts from outside’. Twenty one point five per cent (21.5%) of the managers indicated that they were encouraged, while 17.0% of the managers said they encouraged their employees to ‘source for designs concepts from outside’ the enterprise’. The results are shown in Table 4.9.

Table 4.9: Priorities for Enhancing Design Knowledge

Design Knowledge	Manager (%)	Employees (%)	Manager & Employee (%)
Acquire product design knowledge	22.5	14.5	62.8
Share design knowledge within the enterprise	18.3	14.5	67.2
External Sourcing of Design Concepts	21.5	17.0	61.5

Source: Survey data. 2020

4.4.1.3.7 Design Skill Upgrade.

The enterprise managers were also asked whether both they and their employees were encouraged to ‘keep their design skills up to date’. A majority sixty three point nine (63.9%) managers indicated that both they and the employees were encouraged to “keep their design skills up to date’. Twenty two point six per cent (22.6%) of the managers indicated that they were encouraged, while 13.5% of the managers said they encouraged their employees to ‘keep their design skills up to date’.

The managers were asked to indicate the things they consider important in design skill upgrade. Ninety four per cent (94%) of the respondents considered acquiring skilled personnel and improving in-house skills as important, 82% of the respondents considered accessing external expertise an important aspect of design practice, 71% of the respondents considered offering design training after employment an important aspect of design skill upgrade and 40% of the respondents considered employing foreign experts an important aspect of design skill upgrade, as shown in Table 4.10.

Table 4.10: Manager’s Priorities for Enhancing Design Abilities

Skill Upgrade	n	Frequency	%
Engaging skilled personnel	149	140	94
Improving in-house skills	149	140	94
Engaging external expertise	147	121	82
Carry out design training	148	105	71
Foreign experts employed	144	57	40

Source: Survey data. 2020

4.4.1.3.8 Customer and Competitor Orientation.

The respondents were asked three questions to gauge the enterprise's customer relation. These questions sought to find out how often the enterprises; (1) acquired customer information to improve the product design and production, (2) have adequate information about customers, and (3) have adequate information about competitors. Sixty five per cent (65 %) of the respondents always acquired customer information to improve the product design and production; similarly 65% always have adequate information about customers. Only 43% of enterprises always have adequate information about competitors as indicated in Table 4.11.

Table 4.11: Customer and Competitor Orientation

Orientation	Frequency	%
Acquiring customer information for design	97	65
Having adequate info about customers	96	65
Having adequate info about competitors	64	43

Source: Survey data. 2020

4.4.1.3.9 Process Chain of Product Design Work.

The respondents were asked to indicate the process route (chain) they followed in their design work. Process Chain 1_ A majority (91.9%) of the respondents indicated that their design work goes through the following process, Consumer Requirement (customer brings/selects design) → Product creation. Process Chain 2_ Eighty five point nine per cent (85.9%) of the respondents said that their design work goes through the following process: Consumer Requirement (For own design idea) → Product Feasibility (Research & Development) → Product creation. This is shown in Table 4.12.

Table 4.12: Process Chain of Design Work

Process Chain of Design Work	N	Frequency	%
Process Chain 1*	149	128	85.9
Process Chain 2**	111	102	91.9

Source: Survey data. 2020

Note:

* Process Chain 1:

Consumer Requirement (For own design idea) → Product Feasibility (Research & Development) → Product creation

** Process Chain 2: Consumer Requirement (Customer brings/selects design) → Product creation

4.4.2 Product Design Performance Analysis

The second objective of the research was to determine the number of product innovations generated by textile MSEs in the combined year's 2016 and 2017. The following null hypothesis was presented:

H₀₂ There is no significant variation in the number of product innovations among textile MSEs.

This following section presents data to answer the research question: How many new product innovations have the textile MSEs launched in in the combined year 2016 and 2017? The section presents the descriptive statistics of the enterprise design goals, type of textile products, product innovations, product imitation, product design challenges, product design parameters ratings, environmental factors favouring intrapreneurship, self-assessment of the enterprises innovation performance, and finally the textile MSEs manager's innovation orientation.

4.4.2.1 Product Innovation

The respondents were asked to indicate the product innovations that were introduced in the combined years of 2016 and 2017. Figure 4.9 shows the percentage of innovations by the textile MSEs

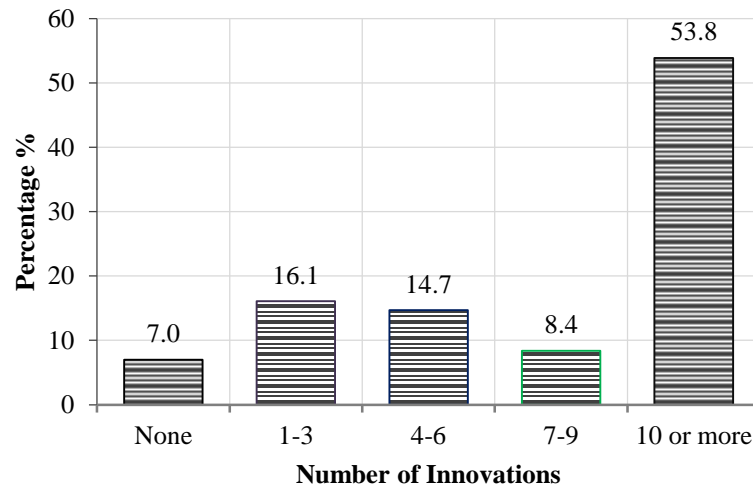


Figure 4.8: Product Innovations

Source: Survey data. 2020

In the combined years 2016 and 2017, 7.1% of respondents had no product innovations introduced, 16.1% had one to three product innovations introduced, 14.7% had four to six product innovations introduced, 8.4% had seven to nine product innovations introduced, and 53.8% had ten or more product innovations introduced.

The Chi-square “*Goodness of Fit Test*” was used to measure variation of the product innovation output. The formula used was:

$$X^2 = \sum \frac{(o - e)^2}{e}$$

Where

o = observed frequency

e = expected frequency

If χ^2 (*calculated*) > χ^2 (*tabulated*), with (n-1) d.f, then null hypothesis is rejected otherwise accepted.

If the null hypothesis is accepted, it is reasonable to conclude that the provided distribution follows a theoretical distribution.

The chi-square goodness of fit was used to evaluate the data collected from one hundred and fifty three (153) enterprises and evaluated so as to test and accept or reject the null hypothesis. The variation was evaluated at a critical P value of .10. Table 4.13 presents results of Chi-square goodness of fit test of the variation in the number of new product innovations in the textile MSEs. Results show that the chi-square goodness of fit test is statistically significant (χ^2 (4) = 106.755, $p < .001$). At a significance level of .10. This implies that we reject the null hypothesis and conclude that there are variations in the number of new product innovations reported by textile MSEs, with most enterprises introducing more than 10 new products in the past two years (n=77).

Table 4.13: PD Innovation. Chi-Square Test Results

Test Frequencies			
	Observed N	Expected N	Residual
None	10	28.6	-18.6
1-3	23	28.6	-5.6
4-6	21	28.6	-7.6
7-9	12	28.6	-16.6
10 or more	77	28.6	48.4
Total	143		

Test Statistics

		Product Innovations
Chi-Square		106.755 ^a
df		4
Asymp. Sig.		<.001
Monte Carlo S.	Sig.	<.001 ^b
90% Confidence Interval	Lower Bound	.000
	Upper Bound	.015

a. 0 cells (.0%) have expected frequencies less than 5. The minimum expected cell frequency is 28.6.

b. Based on 153 sampled tables with starting seed 926214481.

Source: Survey data. 2020

Results show that the test was significant; therefore the null hypothesis was rejected, since there were variations in the amount of product innovations by Textile MSEs. ($\chi^2 (1) = 106.755, p < .001, p < .10$). This was confirmed by the Monte Carlo Simulation Test.

The above test was performed when the independent variable was taken as a scale measurement. The test was then repeated when the independent variable was taken as a dichotomous nominal measure. One hundred and fifty three enterprises were sampled and evaluated to determine whether the numbers of innovative enterprises were equal to the non-innovative enterprises. This required the multiple-category variable to be transformed into dichotomous variables that indicated the existence or absence of the categories. That is either innovative or not innovative. Innovative enterprises were operationalised as those that reported seven or more innovations in two years, while non-innovative enterprises were those that reported six or less innovations. Majority of the enterprises 89 (58.1%)

were categorized as innovative while 64 (41.8%) were not innovative as shown in Table 4.14. The data was analysed using the chi-square goodness of fit test and verified for reliability using the Monte Carlo simulation test.

Table 4.14: PD Innovation. (Dichotomy), Chi-Square Test Results

Test Frequencies

	Observed N	Expected N	Residual
Not Innovative ^a	64	76.5	-12.5
Innovative ^b	89	76.5	12.5
Total	153		

- a. Six and below (innovations / New products)
- b. Seven and above (innovations)

Test Statistics

		Innovations
Chi-Square		4.085 ^a
Df		1
Asymp. Sig.		.043
Monte Carlo S.	Sig.	.052 ^b
90% Confidence Interval	Lower Bound	.023
	Upper Bound	.082

- a. 0 cells (.0%) have expected frequencies less than 5. The minimum expected cell frequency is 76.5.
 - b. Based on 153 sampled tables with starting seed 299883525
- Source: Survey data. 2020

Results show that the test was significant; therefore the null hypothesis was rejected, since there were variations in the amount of product innovations by Textile MSEs. ($\chi^2 (1) = 4.085, p = .052, p < .10$). This was confirmed by the Monte Carlo Simulation Test.

4.4.2.2 Other Factors to Consider in PD Performance

The following sub-section presents data of indicators that could give reasons for the enterprises variation in product design performance. The attributes studied were; enterprise's goals, type of textile products, product design challenges and product imitation.

4.4.2.2.1 Enterprise's Goals.

Eighty three point four per cent (83.4%) of the respondents asserted that their design activities are aligned to the vision and goals of the enterprise.

Table 4.15: Design Alignment with Vision

	Frequency		Per cent
	no	yes	%
Design activities are aligned to vision and goals	151	126	83.4

Source: Survey data. 2020

Sixty one point six per cent (61.6%) of the respondents said that their product design targets were accomplished in the last year.

Table 4.16: Accomplished Product Design Targets

		Frequency	Per cent	Valid Per cent
Valid	True	85	55.6	61.6
	False	53	34.6	38.4
	Total	138	90.2	100.0
Missing	System	15	9.8	
Total		153	100.0	

Source: Survey data. 2020

4.4.2.2.2 Textile Products.

The type of textile products the enterprises said they produced were categorized into three primary groups; Apparel, Fashion accessories and household furnishings, as indicated in Figure 4.9

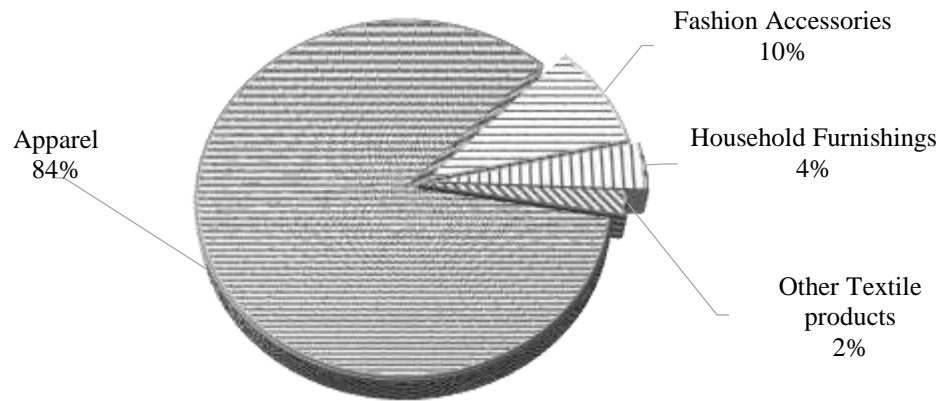


Figure 4.9: Textile Product Categories

Source: Survey data. 2020

Majority of the Textile products belonged in the Apparel category, which had 84% of all the products. The apparel category was broken down to indicate the type of textile apparel product as shown in Figure 4.10.

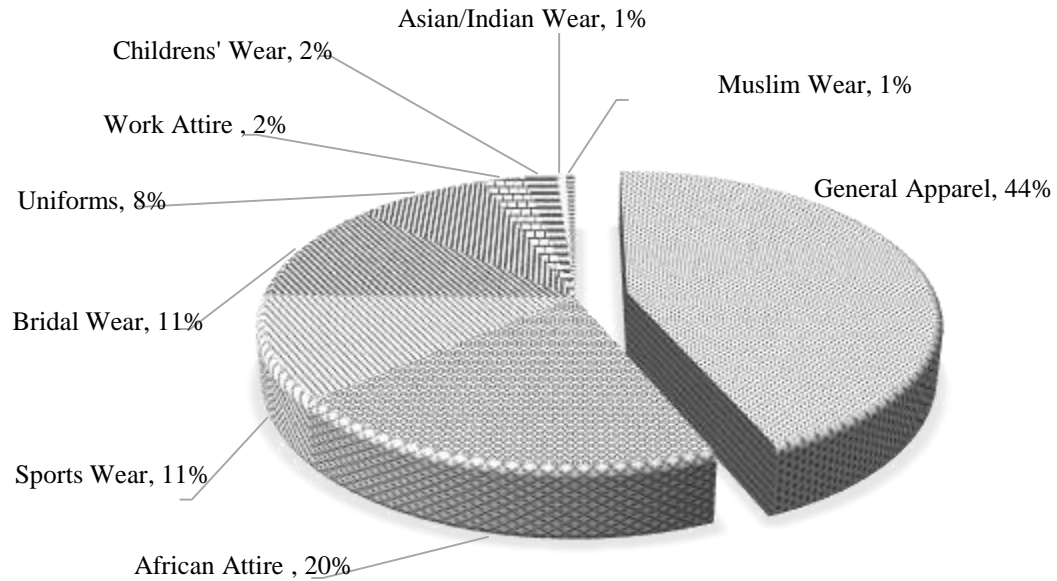


Figure 4.10: Textile Apparel Product Types

Source: Survey data. 2020

Majority of the products in the textile apparel category were of the general apparel at 44% followed by African wear at 20%.

4.4.2.2.3 Product Design Barriers/Challenges.

Respondents were asked to indicate their enterprise's product design barriers/challenges. The questions were open-ended. Figure 4.11 shows that 51.3% of the respondents had difficulty generating new designs, 60.8% of the respondents lacked human resources for design, 41.8% of the respondents had weak capacity to lead with risk and 63.8% of the respondents had shortage of funding for product design.

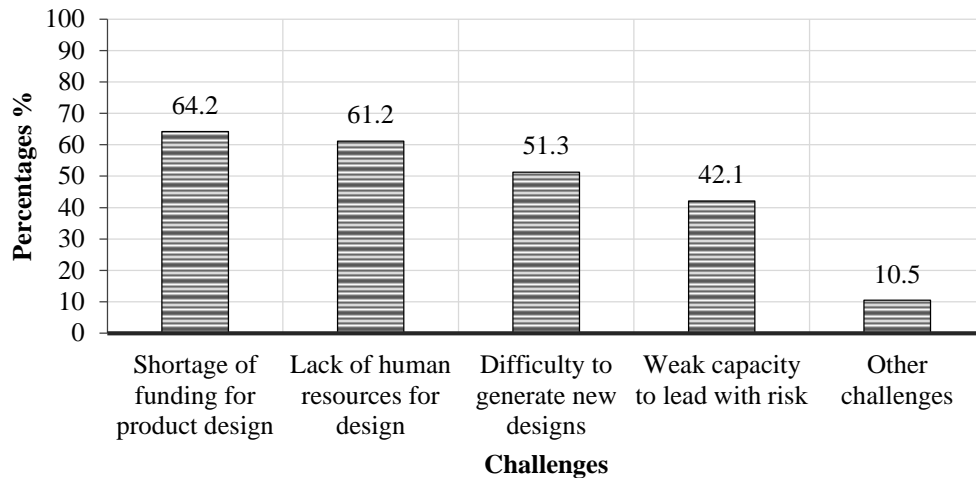


Figure 4.11: Product Design Barriers/Challenges

Source: Survey data. 2020

Both managers and employees were asked to indicate their enterprise’s product design barriers/challenges. The responses collected were grouped into six distinct challenge categories as indicated in Figure 4.12. The creativity category which comprises product design origination and design process had the most challenges mentioned by both the Managers and Employees at 88.2% and 79.7% respectively. The category of Work environment challenges had a distinct relative difference of 25.5% between the managers and employees; the response was 11.1% and 36.6% respectively. The motivation category also had a distinct difference between the managers and employees; the response was 2% and 25.5% respectively.

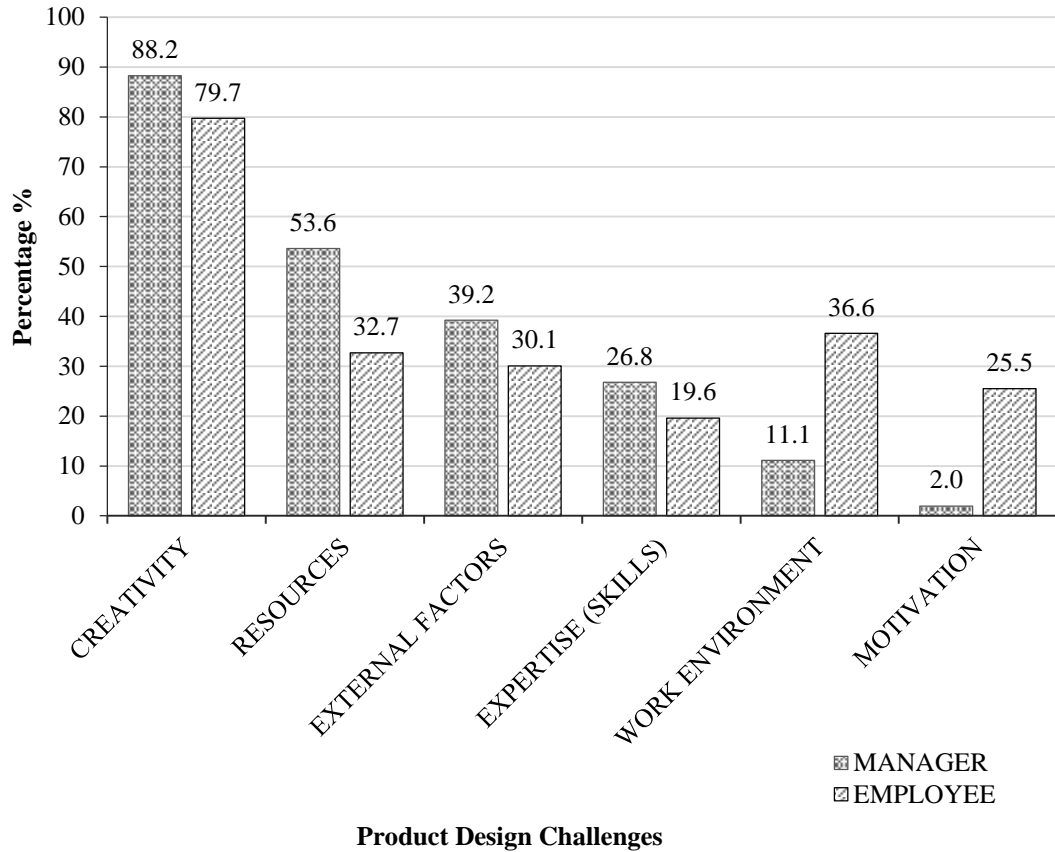


Figure 4.12: Textile MSEs Product Design Challenges

Source: Survey data. 2020

The managers' top three challenge in creativity were (1) Lack of Design skills at 49.7% (76 enterprises), (2) Limited time for creativity/design activities at 31.4% (48 enterprises), and (3) copying and imitation at 29.4% (45 enterprises). The employees' top three challenge in creativity were (1) Limited time for creativity/design activities at 30.7% (47 enterprises), (2) Lack of Design skills at 29.4% (45 enterprises), and (3) limited cooperation/collaboration among designers at 18.3% (28 enterprises). This is shown in Figure 4.13.

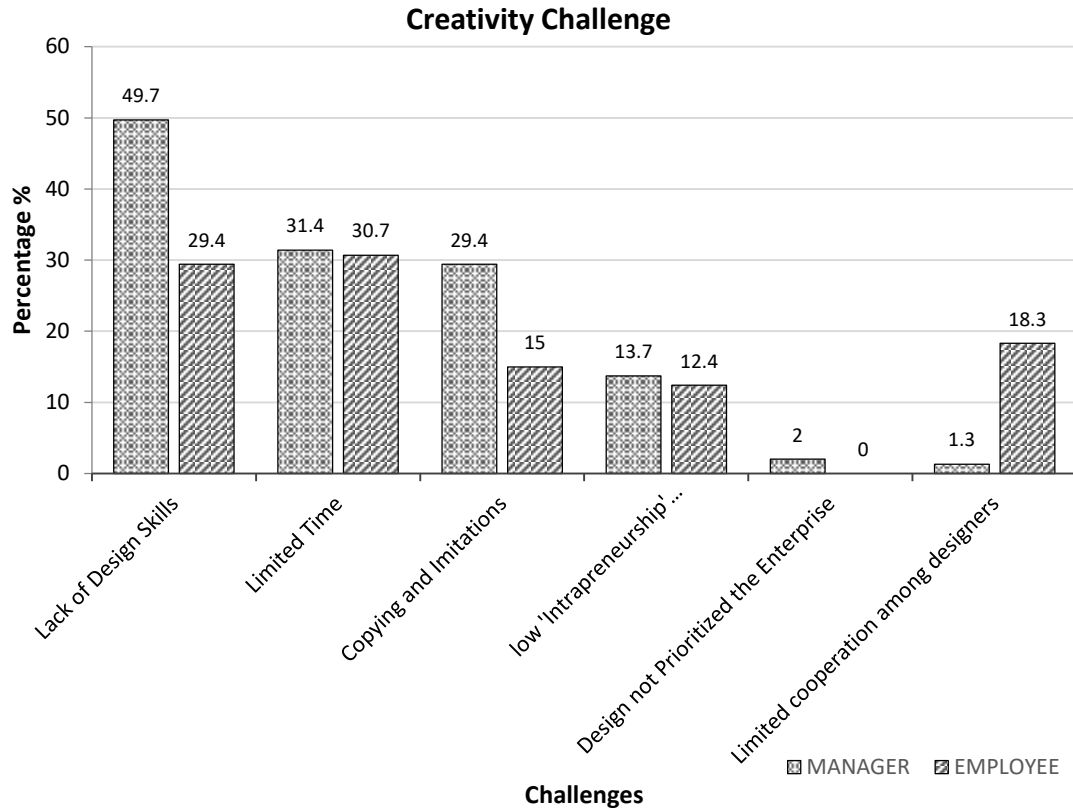


Figure 4.13: Textile MSEs' Product Design Creativity Challenges
 Source: Survey data. 2020

Respondents were asked to suggest possible solutions to the product design and development challenges they had mentioned. The suggestions were grouped into categories as shown in Figure 4.14. The top three suggested solutions given by the managers to the challenges experienced by enterprises in their design and development processes were solutions for (1) creativity and design constraints, mentioned by 55.9%, (2) expertise and skill constraints, mentioned by 20.6%, and (3) external factors constraints, mentioned by 17.3%.

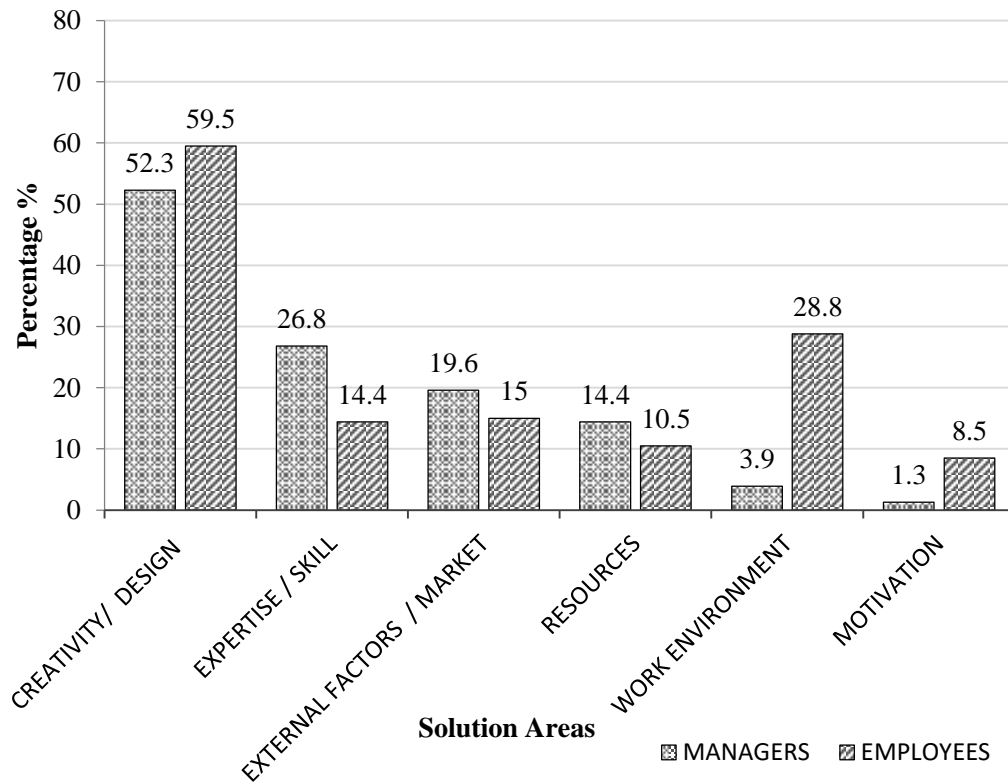


Figure 4.14: Suggested Solutions to Product Design Challenges
 Source: Survey data. 2020

4.4.2.2.5 Product Imitation.

The manager respondents were asked to state whether their enterprises had been affected by product imitation. Seventy five per cent (75%) of the respondents said that their enterprises had been affected by product imitation.

Respondents were further asked to indicate how many of their products were imitated. The responses were captured in four scales; the respondents who said that 1 to 3 of their enterprise products had been affected by imitation were 29.2%, the respondents who said that 4 to 6 of their enterprise products had been affected by imitation were 21.2%, the

respondents who said that 7 to 9 of their enterprise products had been affected by imitation were 3.5% and respondents who said that more than 10 of their enterprise products had been affected by imitation were 46.0%. Figure 4.15 illustrates this finding.

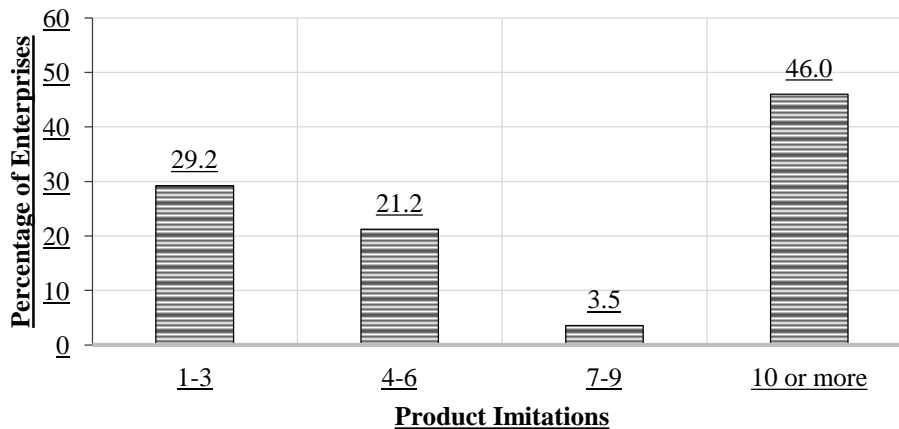


Figure 4.15: Enterprise Affected by Product Imitation

Source: Survey data. 2020

Twenty nine point four (29.4%) per cent of managers and 15% of employees mentioned imitation as a constraint as compared with the other creativity/design challenges that included Lack of design skills; Limited time; low Intrapreneurship (Fear to Fail); Design not prioritized by the enterprise; and Limited cooperation/collaboration among designers. A breakdown of the product imitation creativity challenge mentioned by the enterprises are indicated in Figure 4.16.

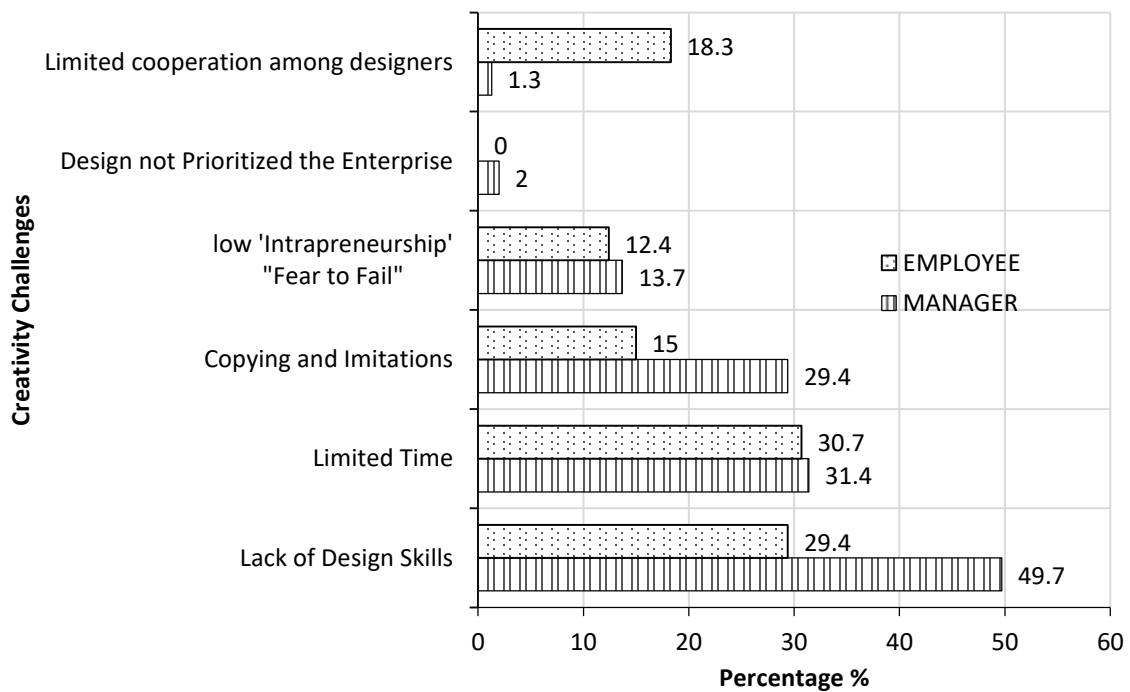


Figure 4.16: Product Imitation a Creativity Challenge

Source: Survey data. 2020

4.4.3 Influences of Product Design Strategies on the Performance of Textile MSEs

The third objective of the research was to discover the influence of product design strategy on performance amongst the textile MSEs. The following null hypothesis was presented

H₀₃ There is no significant influence of product design strategies on the performance of textile MSEs in Nairobi City County, Kenya.

4.4.3.1 The Multiple Logistic Regression Test

The influence of different independent variables on the dependent variable was measured using the Multiple Logistic Regression test. This was accomplished with the use Logistic Regression application test for IBM SPSS version 29. Multiple logistic regression is a

statistical approach used to model the connection between multiple independent variables and a binary /dichotomous dependent variable. In contrast to linear regression, which predicts continuous outcomes, logistic regression predicts the likelihood of an event happening.

The formula for the Multiple Logistic Regression model with n predictor variables is:

$$y = \beta_0 + \beta_1x_1 + \beta_2x_2 + \beta_3x_3 + \dots + \beta_nx_n + \varepsilon,$$

Where

y= Dependent Variable/outcome

β_0 = Constant

β_1x_1 =First Independent Variable/ Predictor

ε = Error term

The assumptions for the Multiple Logistic Regression Analysis Test were:

1. The dependent variable is a binary (a dichotomous) variable.
2. The datasets are distinct from one another. This implies that the results of one observation shouldn't affect those of another.
3. The dependent and independent variables are not assumed to have a linear relationship.
4. There is no strong correlation between any two or more independent variables in the regression model. The Multicollinearity is evaluated using a variance inflation factor (VIF) value.
5. Outliers are thoroughly inspected and, if necessary, eliminated from the dataset, because they may significantly affect the regression model, producing estimates that are skewed.
6. A sufficient sample size is used to achieve accurate estimations and reliable inferences,

The multiple logistic regressions results for product design (PD) strategies is presented in

Table 4.17. Respondents indicating yes to using comparison with high performers in the same trade (Benchmarking) are shown by an odd ratio of .369. The odds ratio was less than 1, which indicates that the odds of the event occurring are lower compared to the reference category. In other words, the probability of the event happening is reduced, in this case by -.997. The odds ratio for Research activities was less than 1 (.275), which indicates that the odds of the event occurring are lower compared to the reference category. In other words, the probability of the event happening is reduced, in this case by -1.291. However, the influence of Benchmarking and Research on innovation was significant, as shown by a p-values of .008 and .002 respectively, when compared with other independent variables. Therefore, Benchmarking and Research strategies are significant predictors/influencers of Textile MSE innovation/performance.

The confidence interval (CI) for the exponent (β) helps determine the relationship's significance and provides a measure of the precision and uncertainty associated with the estimates. Benchmarking had a significance of a 90% CI interval of exponent (β), and Research had a 90% CI interval of exponent (β). The narrower confidence intervals relative to those of the other variables indicated a more precise estimate.

Table 4.17: Multiple Logistic Regression Analysis of PD Strategies

		Variables in the Equation					90% C.I. for EXP(B)		
		B	S.E.	Wald	df	Sig.	Exp (B)	Lower	Upper
Step 1 ^a	Benchmarking Strategy(1)	.997	.373	7.142	1	.008	2.710	1.467	5.007
	Association Strategy(1)	-.285	.641	.197	1	.657	.752	.262	2.160
	Collaboration Strategy(1)	.578	.472	1.496	1	.221	1.782	.819	3.875
	Original Strategy(1)	.104	.404	.067	1	.796	1.110	.571	2.155
	Research Strategy(1)	-1.291	.407	10.067	1	.002	.275	.141	.537
	Diversification Strategy(1)	.307	.401	.587	1	.443	1.360	.703	2.629
	New Technology Strategy(1)	.119	.386	.095	1	.758	1.127	.597	2.127
	Constant	.065	.835	.006	1	.938	1.068		

a. Variable(s) entered on step 1: Benchmarking Strategy, Association Strategy, Collaboration Strategy, Original Strategy, Research Strategy, Diversification Strategy, and New Technology Strategy.

Source: Survey data. 2020

The discussion and interpretation of the results to find the influences of product design strategies on the performance of textile MSEs are given in Chapter 5, Section 5.5. The complete multiple logistic regression test results are shown in Appendix H.

4.4.3.2 The General Linear Model (GLM) UNIANOVA test

To analyse the means of predictors (Product design Strategies) on the continuous dependent variable (Innovation as an interval scale), the General Linear Model (GLM) univariate analysis of variance (UNIANOVA) test was utilized. It analyses whether there are significant variations in means after accounting for the other independent variables. The UNIANOVA approach computes the variance of one dependent variable by one or more independent variables. The SPSS version 29 was used to perform the test, with the following assumptions:

1. The dependent variable is continuous
2. The independent variable is composed of two or more distinct category groups.
3. Data is made up of independent observations.
4. There should be no major outliers in order for the results to be valid.
5. The dependent variable should be approximately normally distributed.
6. The variances in the data must be homogeneous.

Levene's Test of Equality of Error Variances

A Levene's test of equality of error variance was used to assess whether the variances of different groups in the textile MSEs sub-dataset on PD strategies are equal, and to ensure the assumptions of homogeneity of variances are met. Table 4.18 shows the test

results.

Table 4.18: ANOVA: Test of Equality of Error Variances

		Levene Statistic	df1	df2	Sig.
Product innovations	Based on Mean	3.397	24	98	<.001
	Based on Median	1.525	24	98	.077
	Based on Median and with adjusted df	1.525	24	55.741	.098
	Based on trimmed mean	3.345	24	98	<.001

Source: Survey data. 2020

Levene’s test states a null hypothesis that the error variance of the dependent variable is equal across groups. The samples for the test were from 143 respondents and not 153 due to missing values. Levene’s test also states that the null hypothesis of equal population variances is rejected when $p < .10$.

Tests of Between-Subjects Effects

The test of between-subjects effect in UNIANOVA is used to assess whether or not the independent variables have a statistically significant effect on the dependent variable (Berg, 2023a). The results shown in Table 4.19, indicate that the influence of PD strategies on the Performance (Product innovation) of textile MSEs, was statistically significant. $F(44, 98) = 2.847, p < .001$. With 56.1% of the variance in Product Innovations being attributed to the PD strategies.

Table 4.19: ANOVA: Tests of Between-Subjects Effects

Dependent Variable: Product Innovations

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
--------	----------------------------	----	----------------	---	------	------------------------

Corrected Model	155.539 ^a	44	3.535	2.847	<.001	.561
Intercept	578.938	1	578.938	466.335	<.001	.826
Benchmarking	4.065	1	4.065	3.274	.073	.032
Association	4.143	1	4.143	3.337	.071	.033
Collaboration	.011	1	.011	.009	.924	.000
Originality	5.541	1	5.541	4.463	.037	.044
Research	9.736	1	9.736	7.842	.006	.074
Diversification	.042	1	.042	.034	.855	.000
New Technology	.312	1	.312	.251	.617	.003
Benchmarking * Collaboration	4.420	1	4.420	3.560	.062	.035
Benchmarking * Originality	.009	1	.009	.007	.933	.000
Benchmarking * Research	2.435	1	2.435	1.961	.165	.020
Benchmarking * Diversification	18.441	1	18.441	14.855	<.001	.132
Benchmarking * Technology	.004	1	.004	.003	.955	.000
Collaboration * Research	1.021	1	1.021	.823	.367	.008
Collaboration * Diversification	1.080	1	1.080	.870	.353	.009
Collaboration * Technology	3.459	1	3.459	2.786	.098	.028
Originality * Diversification	10.195	1	10.195	8.212	.005	.077
Research * Technology	1.242	1	1.242	1.001	.320	.010
Diversification * Technology	.589	1	.589	.474	.493	.005
Error	121.663	98	1.241			
Total	2408.000	143				
Corrected Total	277.203	142				

a. R Squared = .561 (Adjusted R Squared = .364)

*Combined strategies

Source: Survey data. 2020

The p-value indicates whether independent variables have a significant effect on the dependent variable and estimates the probability that the observed results are due to chance. The Partial Eta Squared (η^2) indicates the effect size of the relationship.

The strategies having some influence on the dependent variable are Benchmarking, Association, Originality, Research, Benchmarking combined with Collaboration, Benchmarking combined with Diversification, Collaboration combined with Technology, and Originality combined with diversification.

4.5 Product Design Self-Assessment

Apart from obtaining data to test the research hypotheses, the attitude of the managers towards intervening variables in the process of design and innovation was sought. The following sub-sections present the data on product design parameter ratings, intrapreneurial environment, Design Management and comparison with main competitors.

4.5.1 Product Design and Development Parameter Rating.

Respondents were asked to rate their enterprises' performance regarding product design parameters indicated in Figure 4.17. Majority (60.5%) of the respondents said that their product quality in meeting customer needs was excellent, 51% of the respondents said that their timely responsiveness to technological development was excellent, while 45.3% of the respondents said that Investment in product design and development was excellent. 45% of the respondents said that their timely responsiveness to competitive forces was excellent, 41.7% of the respondents said that their capability to develop efficient and economical products was excellent, and a low percentage (35.3%) of the respondents said that product design funding was excellent.

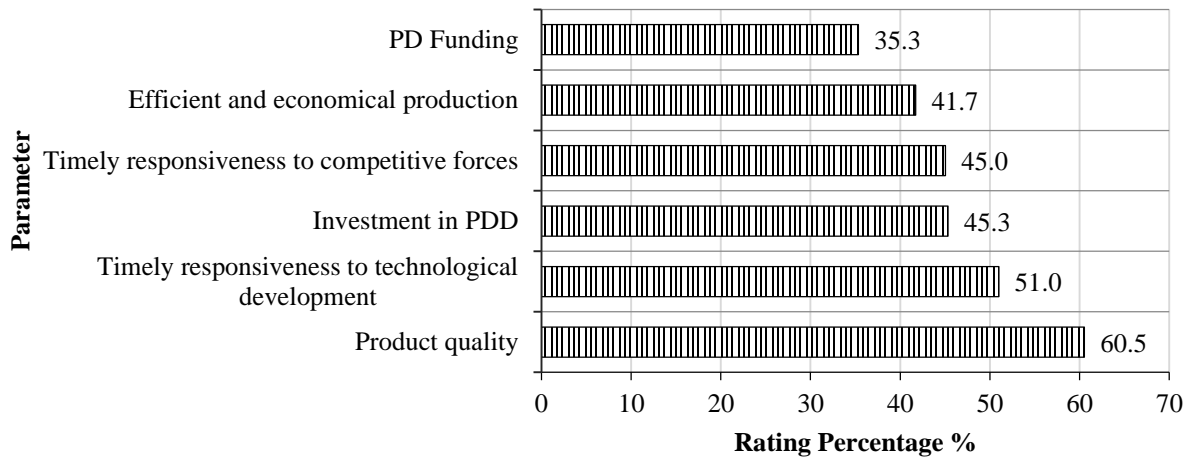


Figure 4.17: Product Design and Development Parameter Rating
Source: Survey data. 2020

4.5.2 Intrapreneurial Environment

Employees were asked to rate the enterprise environment. A tally of the intrapreneurship attribute scores were done for the enterprises. The ratings ordered on a five-point Likert scale were 1 for Very Low, as the lowest score and 5 for Excellent, as the highest score, as presented in Table 4.20. Overall, most enterprise employee (50%) indicated that their intrapreneurial environment was excellent, while 4.6% and 2.6% indicated that the environment was poor and very poor respectively.

Table 4.20: Average Rating of Intrapreneurial Environment Attributes by Employees

Scale	frequency	%
Very Poor	4	2.6
Poor	7	4.6
Fair	17	11.2
Good	49	32.2
Excellent	76	50.0
Total	152	100.0

Source: Survey data. 2020

Ten environmental attributes were presented to the employees to rate. The highest rated attribute was, ‘freedom to initiate new products’ scoring an excellence rating supported

by 58.2% of the respondents, while the lowest rated was ‘Tolerance to design failures’ supported by 38%.

An ideal intrapreneural environment allows employees the freedom to initiate new products. The enterprises’ focus on this was a percentage of 58.2% scored for an excellence rating supported by eighty nine (89) employee respondents. This is shown in Figure 4.18.

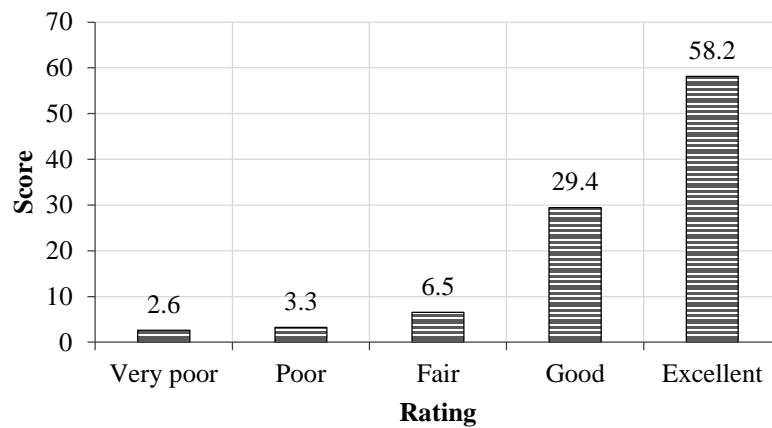


Figure 4.18: Freedom to Initiate New Products.
Source: Survey data. 2020

Adapting new technology has numerous advantages, including more efficient and effective communication, more efficient design and manufacturing, and more efficient product management and marketing systems. A percentage of 56.2% was scored for an excellence rating, supported by eighty-six (86) employees' responses to the question of their enterprise's focus on keeping up with new technology. This is shown in Figure 4.19.

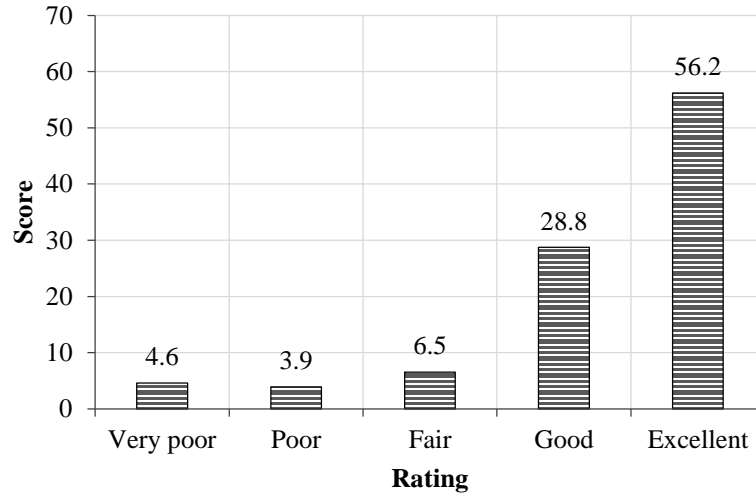


Figure 4.19: Keeping up with New Technology

Source: Survey data 2020

Skill development is essential for employees to increase their job proficiency, and upskilling them keeps them valuable for future career opportunities. The intrapreneural environment question on whether employees were allowed to upgrade their design abilities received a 53.9% excellent rating supported by eighty-two (82) employee respondents. This is shown in Figure 4.20.

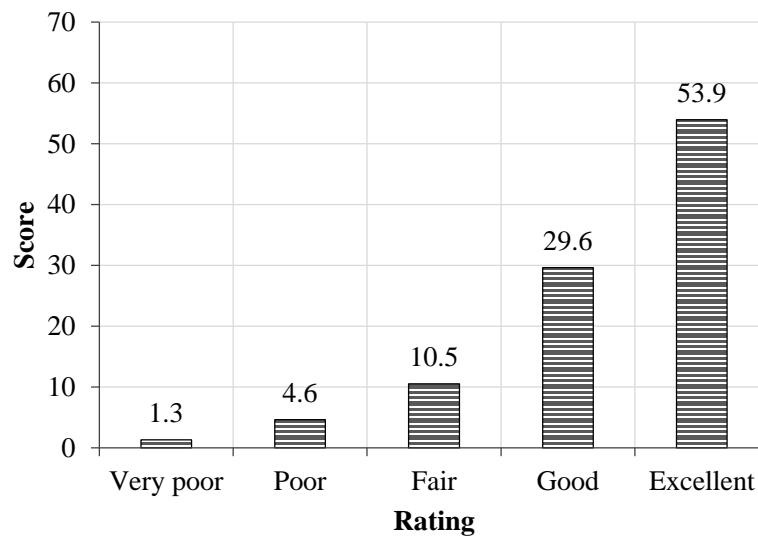


Figure 4.20: Encouragement for Design Skill Upgrading

Source: Survey data 2020

Teamwork is always beneficial to an enterprise. It improves job productivity and expands learning opportunities. A percentage of 53.6% was scored for an excellence rating supported by eighty two (82) employees answering the question of whether their workplace environment encourages creation of teamwork spirit. This is shown in Figure 4.21.

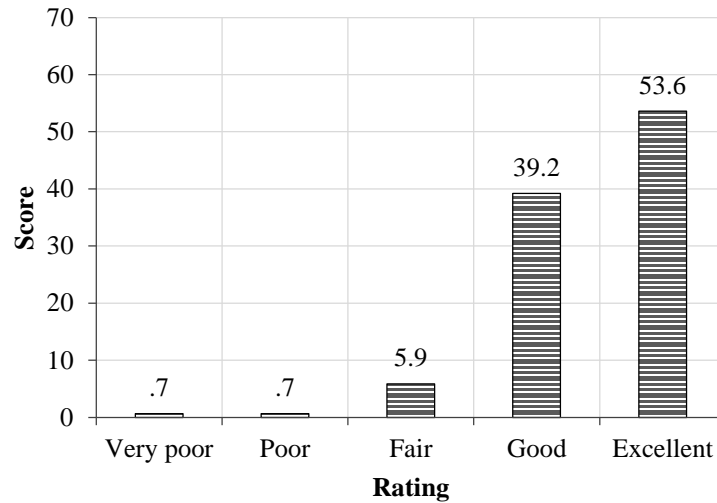


Figure 4.21: Teamwork Spirit
Source: Survey data 2020

Enterprises should make time for and allow staff to conduct research. Research skills help a company uncover client needs and desires, create new products or services, and improve what they do, keep up with industry advances, and compete in their market. Concerning the time allowance for research, a percentage of 51.7% was scored for an excellence rating supported by seventy eight (78) employee respondents. This is shown in Figure 4.22.

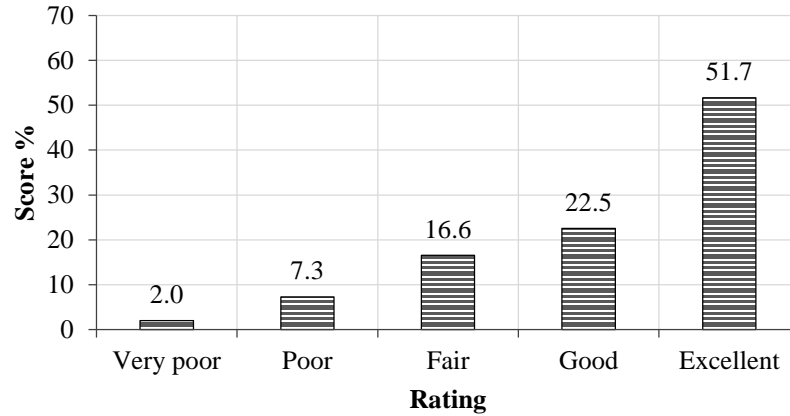


Figure 4.22: Time Allowance for Research
Source: Survey data 2020

Knowledge acquisition assists an enterprise in developing and expanding its knowledge repository in order to support innovation. An ideal work environment promotes and facilitates knowledge acquisition, allowing employees to learn new skills and make informed decisions. Regarding the encouragement to learn and retain knowledge, a percentage of 50.7% was scored for an excellence rating supported by seventy six (76) employee respondents. This is shown in Figure 4.23.

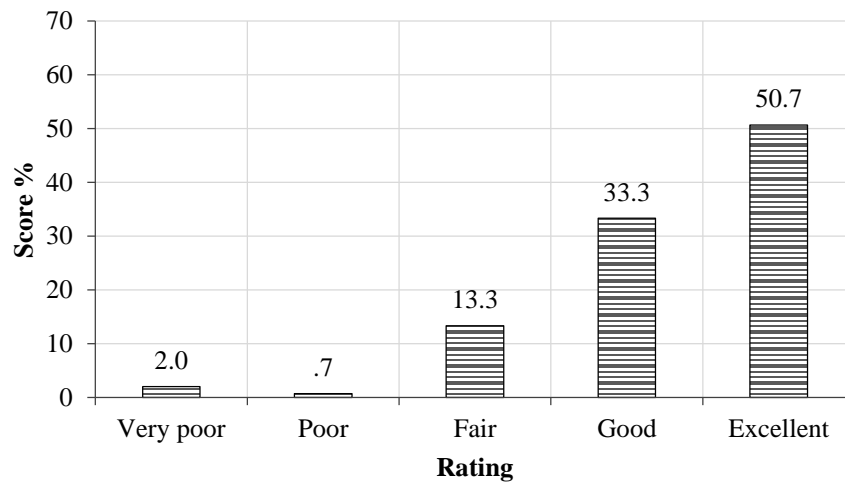


Figure 4.23: Encouragement to Learn and Keep Knowledge
Source: Survey data 2020

Motivated employees are more likely to be innovative, productive, and committed to their work. Recognising and rewarding good work is a way of motivating employees; therefore, employees were asked to rank their companies' emphasis on rewarding good performance. A percentage of 46.4% was scored for an excellence rating supported by seventy one (71) employee respondents. This is shown in Figure 4.24.

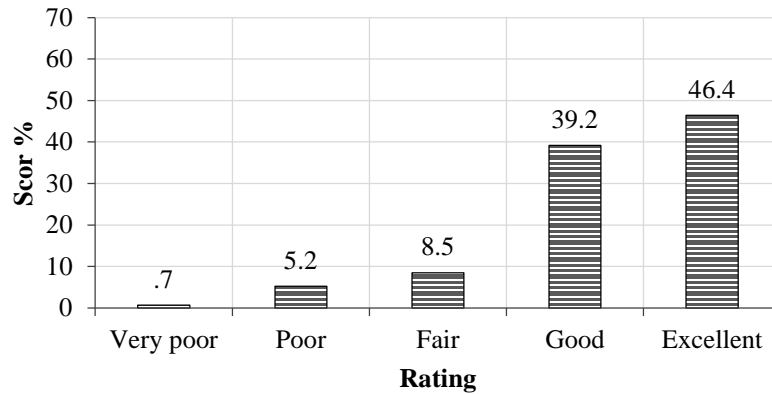


Figure 4.24: Recognition
Source: Survey data 2020

Effective communication is critical to managing relationships with employees, customers, and other stakeholders. It is crucial for fostering teamwork and facilitating feedback and contributions that are necessary for product design and development. On this basis, the employees were asked to rate their enterprise environment's support for unrestricted internal communication. A percentage of 45.8% was scored for an excellence rating supported by seventy (70) employee respondents. This is shown in Figure 4.25.

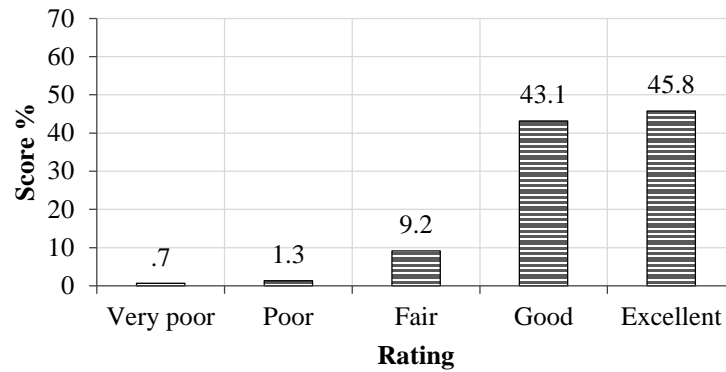


Figure 4.25: Internal Communication

Source: Survey data 2020

Risk-taking is considered to be important for improving creative and innovative ability. According to Amabile and Pratt (2016), innovation is dependent on leaders' willingness to take chances. The enterprise must be risk-tolerant and encourage employees to generate new ideas through risk-taking and experimentation. Darvishmotevali (2019) claims that greater creativity is developed when people have more flexibility to make decisions and take risks. Intrapreneurial environment encourages controlled risks. The rating of the MSEs' encouragement of controlled risks revealed a percentage of 42.5% was scored for an excellence rating supported by sixty five (65) employee respondents. This is shown in Figure 4.26.

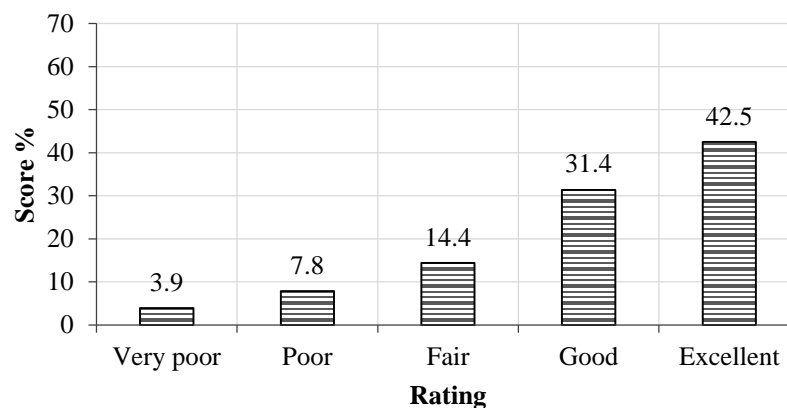


Figure 4.26: Encouragement of Controlled Risks

Source: Survey data 2020

The question of whether design failure is tolerated to some extent relates to the previous one about encouraging controlled risks. Despite widespread opinions that failure is negative, it can be regarded positively when viewed as a learning curve to drive future performance (Kapepa & Vuuren, 2019). A percentage of 38.0% was scored for an excellence rating, supported by fifty-seven (57) employees responding to the question on tolerance for design failures. This is shown in Figure 4.27

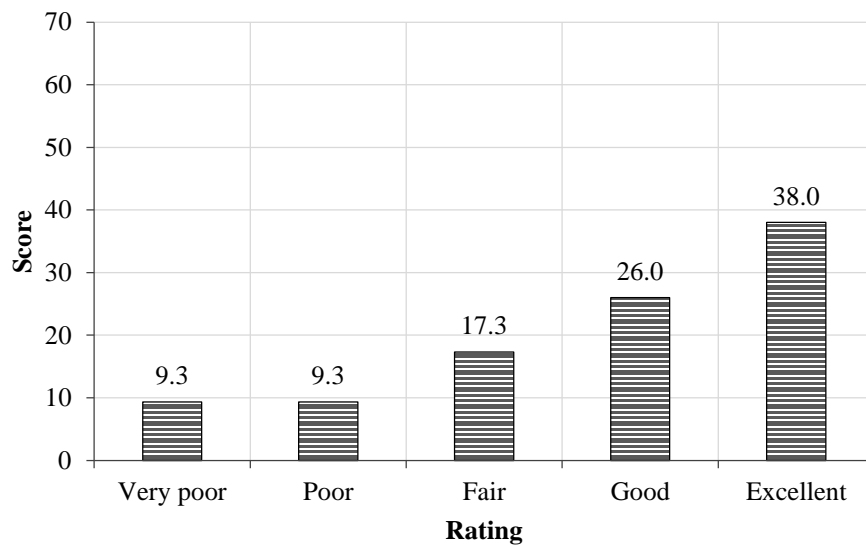


Figure 4.27: Tolerance for Design Failures
Source: Survey data 2020

4.5.3 Design Management

Design management is an intervening variable that influences the work environment in terms of workers' intrinsic motivation, skills upgrade and support for creativity and innovation, and can be linked to the performance of textile MSEs. The information on the design management variables studied included; Formality of operations, Communication, Teamwork, Delegation of authority, Motivation and Recognition. Out of the six variables the most used was recognition of employees work, indicated by 78.4% of the managers, as shown in Figure 4.28. The least popular was Delegation of

authority indicated by 73.9% of the managers as one of their design management strategies.

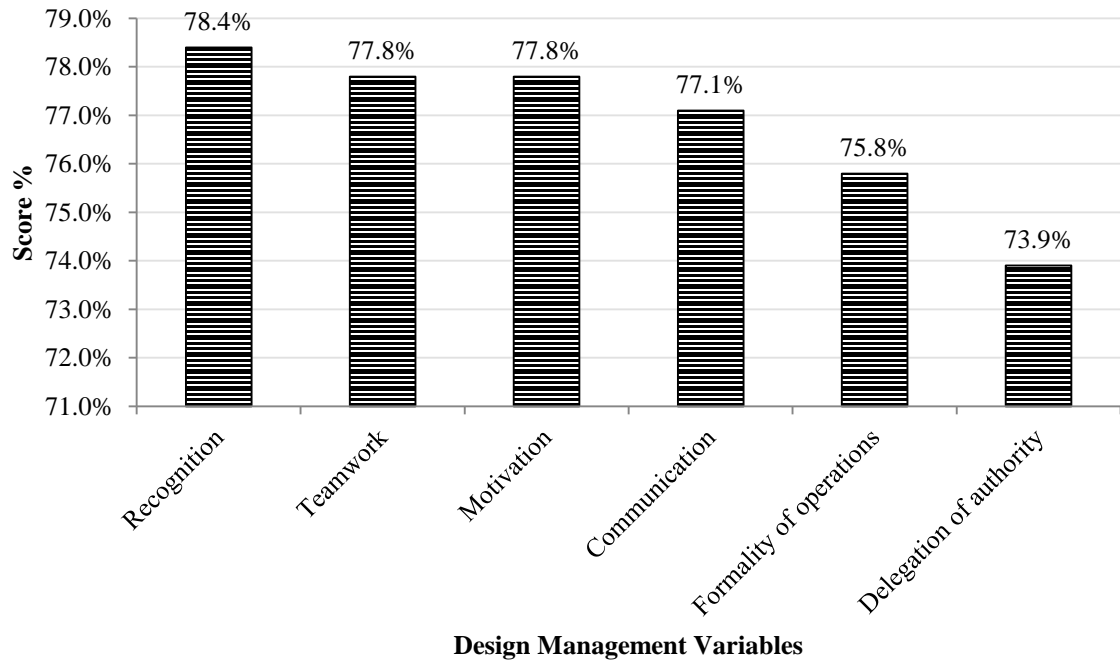


Figure 4.28: Design Management Variables

Source: Survey data 2020

4.5.4 Comparison with Main Competitors.

The respondents were asked to evaluate their self-assessment of the enterprises innovation performance as compared with their competitors on the aspects of Competitiveness, Risk taking, Innovation and First to introduce new designs ('Quickness to market') in Figure 4.29. In each of the four categories, more than 50% of the respondents saw themselves performing better than their competitors. The least mentioned advantage over the competitor was "Quickness to Market" at 55.9%.

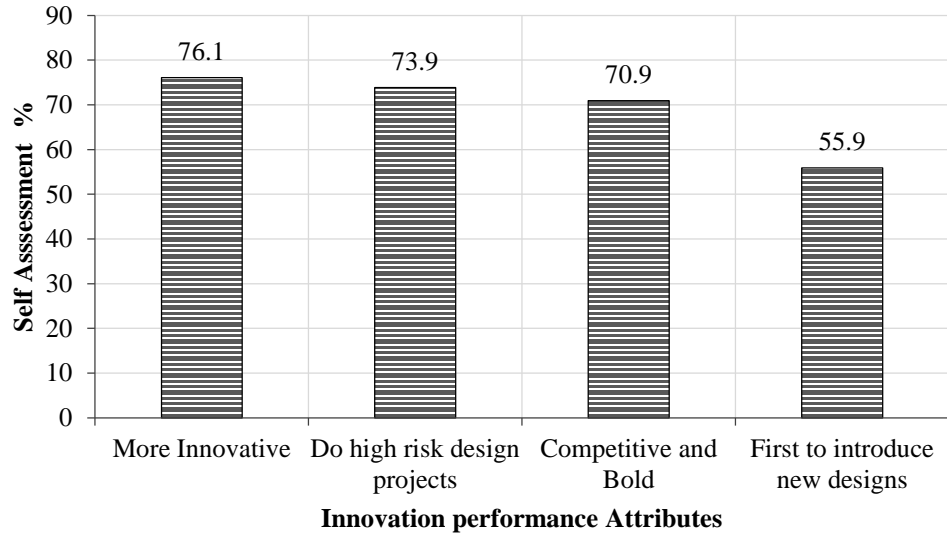


Figure 4.29: Comparison with Main Competitor

Source: Survey data 2020

4.5.5 Manager’s Innovation Orientation Data.

In order to identify the textile MSEs manager’s innovation orientation, a checklist of 15 questions was used to collect data. The responses were recorded as dichotomous variables (1: Yes; 2: No) before frequencies and percentages were calculated for the strategies. Table 4.21 shows the descriptive data from the innovation orientation checklist.

Table 4.21: Manager’s Innovation Orientation

	Checklist Questions	n	Affirmative Frequency	%
1.	Innovative new products help your enterprise’s future success?	134	126	94.0
2.	You control the future success of innovation for your enterprise?	134	118	88.1
3.	New products innovations have more value than old products?	131	105	80.2
4.	Internal innovation will yield greater returns than copying the competitors design?	133	111	83.5
5.	Long-term investments in innovation will yield profits?	133	116	87.2
6.	A balance of new products portfolio will yield profits?	133	114	85.7

7.	New product quantity is valued just as quality?	132	115	87.1
8.	Will new answers to current challenges result in new product opportunities?	131	117	89.3
9.	You are the biggest asset for innovation in your enterprise?	134	97	72.4
10.	Can an effective innovation mind-set inspire staff to perform better?	132	125	94.7
11.	Do you believe you have direct control over the demise or success of innovation?	133	90	67.7
12.	Keeping score/records on innovation is important?	132	124	93.9
13.	You accept that failure is an unavoidable part of the process of innovation?	131	110	84.0
14.	Is a positive and proactive attitude towards innovation critical for morale?	133	124	93.2
15.	One of your top five priorities should be innovation?	132	118	89.4

Source: Survey data 2020

The results show many high scores above 80%; however the threshold is supposed to be high and all enterprises expected to score 100% for 10 out of 15 innovation orientation questions. This belief is based on a formula by Thomas Kuczmariski's "Innovation Creed for Managers" (KICM) test introduced by Ambler (2014). Recognizing that the enterprise manager owner has a leading role in providing a conducive work environment for product design and innovation, he/she must answer "yes" to at least 10 of the 15 beliefs to be innovation focused.

The study found that only 75.2% of the enterprises' managers had a positive attitude towards innovation attributes and only 37.9% were able to answer affirmatively to the 15 test questions. The KICM test results are presented in Table 4.22, which indicates that twenty four point eight per cent (24.8%) of the manager respondents were likely to be an obstacle to attaining high levels of product innovation.

Table 4.22: Kuczmariski’s Innovation Creed for Managers Test Attribute Scores

	SCORES							
	Scores Above 10	Scores below 10	15	14	13	12	11	10
Frequency	115	38	58	17	18	9	7	6
Percentage	75.2%	24.8%	37.9%	11.1%	11.8%	5.9%	4.6%	3.9%

N = 153

Source: Survey data. 2020

This study found that the intrapreneurial attribute that was scored the highest at 94.7% for the design management construct was the belief that keeping score/record of the enterprise’s innovations is important, while the lowest score (67.7%) acknowledged their responsibility for their enterprise’s innovation success. An average of 133 respondents revealed a design management priority score of only 83.5%. The ideal score should be 100%. Table 4.23 indicates the Intrapreneurship orientation ratings.

Table 4.23: Intrapreneurship Orientation _ Managers’ Opinion Rating

PRODUCT DESIGN & DEVELOPMENT CONSTRUCTS		INTRAPRENEURSHIP ORIENTATION ATTRIBUTES	n	RATING
1.	Creativity			
	1.	Will new answers to current challenges result in new product opportunities?	131	89.3
	2.	Can an effective innovation mind-set inspire staff to perform better?	132	94.7
	3.	Maintaining a proactive, optimistic, and positive approach to innovation is critical for safeguarding morale?	133	93.2
	4.	Accept that failure is an inherent component of innovation?	131	84.0
		Average	132	90.3

2.	Innovation			
	1.	Innovative new products help your enterprise's future success?	134	94.0
	2.	New products innovations have more value than old products?	131	80.2
	3.	Internal innovation will yield greater returns than copying the competitors design?	133	83.5
	4.	Product innovation quantity and quality are equally important?	132	87.1
		Average	133	86.2
3.	Design Management			
	1.	You control the future success of innovation for your enterprise?	134	88.1
	2.	Long-term investments in innovation will yield profits?	133	87.2
	3.	A balance of new products portfolio will yield profits?	133	85.7
	4.	You are the biggest asset for innovation in your enterprise?	134	72.4
	5.	You believe that the success or failure of innovation is entirely dependent on your actions?	133	67.7
	6.	Keeping score on innovation is important?	132	93.9
	7.	One of your top five priorities should be innovation?	132	89.4
		Average	133	83.5

Source: Survey data. 2020

The intrapreneurship orientation attributes were grouped into three categories of Creativity, innovation and design Management with their ratings as shown in Figure 4.30. The managers' opinions on the product design constructs were calculated as an average of the attributes. The product design constructs; Creativity, Innovation and Design Management scores were 90.3%, 86.2% and 83.5% respectively.

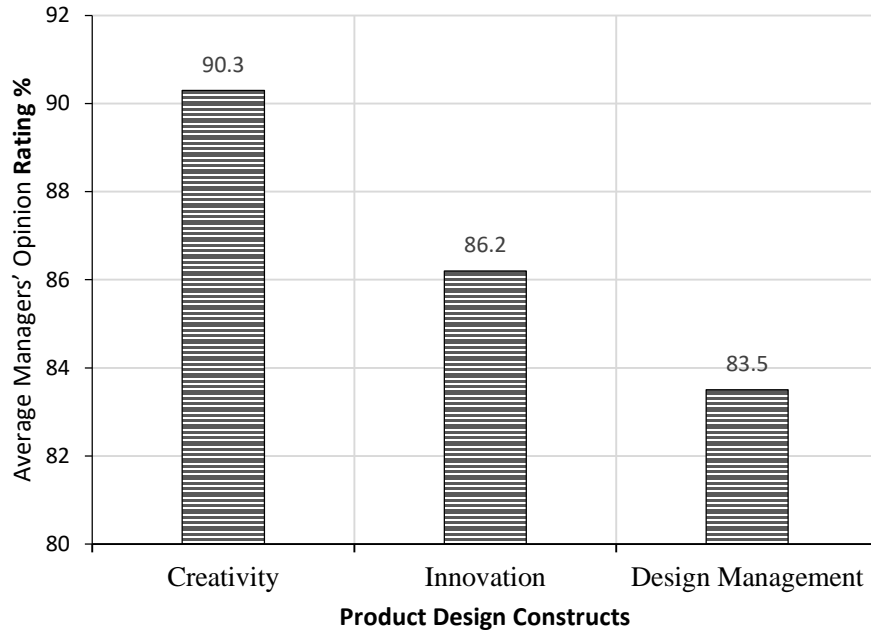


Figure 4.30: Manager's Intrapreneurship Orientation

Source: Survey data. 2020

Some of the triggers that ignite innovation in MSEs are financial drivers that will enable research and development activities and technological drivers that can provide MSEs with new opportunities to improve their operational efficiency. Identifying new market opportunities is another trigger for innovation in MSEs. Another trigger is human drivers. They are creative leaders (Intrapreneurs) who possess a unique ability to think outside the box, challenge the status quo, and drive change. By understanding the triggers and leveraging them effectively, MSEs can create a competitive advantage and thrive in today's fast-paced business world.

CHAPTER FIVE: INTERPRETATION AND DISCUSSION OF FINDINGS

5.1 Introduction

The chapter discusses the findings of the research based on the three specific objectives of the study namely: The product design strategies used by textile MSEs, The performance of textile MSEs, and The influence of product design strategies on the performance of the textile MSEs. The chapter is thus divided into sections relating to the objectives; however it starts with a section on the enterprises' demography influence on PD/Performance.

5.2 Demographic Factors influence on PD/Performance,

Jajja, Kannan, Brah and Hassan (2017) state that “empirical evidence of the impact of contextual variables on product innovation in emerging economies is limited” (p. 13). The following sub sections discuss the influence of selected variables on the Nairobi textile firm's performance (innovation). They included the age of the enterprise, the number of employees, the education level of managers and employees, and the employees' years of work experience in the enterprise.

5.2.1 Age of Enterprise

One of the main characteristics of MSMEs in Kenya as stated by Wairimu (2015) is that the MSMEs "Have a very high turnover rate - many new businesses are created, many fail, and a few grow"(p. 25). The findings of this study attested to this characteristic noting that majority (73.3%) of the Nairobi enterprises in the study had less than 10 years of operations, while only 3.4 % had existed for over 31 years.

The age of an enterprise is a demographic factor that has been found to influence firm performance (Coad, et al., 2016, Osunsan, et al., 2015, Radipere & Dhliwayo, 2014, Stam & Wennberg, 2009). Berkel and Tarp (2020) reported that “the age of a firm was found to positively influence performance of enterprises in developing countries, perhaps because older enterprises have more experience” (p. 10). Jajja et al. (2017) write that company variables including age and number of employees impact product innovation. They explain how this happens in the following passage:

“Older companies are able to innovate more effectively than newer ones. This may be a reflection of the time it takes for firms to develop the knowledge, resources, and relationships that positively impact product innovation. Scarcity of resources and a lack of efficient, transparent structures for resource allocation, both common problems in emerging markets, give older companies an advantage over newer ones that lack the networks, both business and political, needed to acquire resources.” (Jajja et al. 2017. P 16)

Jajja et al. (2017) state that with age most enterprises get to set achievable targets; additionally, with age most enterprises gain adequate resources to accomplish their targets. Coad et al. (2016) state that the effect of age on firm performance is moderating. Noting that enterprises gain experience and build on earlier routines and skills as they mature, which has an impact on innovation. A company's age also has an impact on the likelihood of superior organisational outcomes and benefits from its innovation investments. As a result, they usually have higher levels of production and profitability.

5.2.2 Number of Employees in the Enterprise

Establishing the number of employees is one approach to determine firm size. Studies like Jajja et al. (2017) observed that number of employees did not significantly increase the explained variance in product innovation when included in the regression model.

5.2.3 Highest Education Level of Manager

Good education, years of training and work experience are believed to influence an entrepreneur's motivation to develop their skill set, self-confidence, and other creative capabilities (Reeg, 2015). The level of education of the manager and employees has been shown to contribute to firms' innovative capabilities and enterprise growth (Vinding, 2006). Kotur and Anbazhagan (2014) state that for labourers and not the white collar professionals, an increase in educational qualifications will show a decline in the performance of the worker.

Aladejebi (2018) mentions that human capital theorists posit that “there is a direct positive relationship between formal education and productivity” (p.2). However, Aladejebi opines that there are different perspectives to the human capital theory apart from formal education; three perspectives conveyed are; formal education and professional training, workplace training through specific activities such as research and innovation or participation in various associations/professional networks, and non-formal education at work (on the job).

5.2.4 Years Worked in the Enterprise

The years one has been engaged in the same firm could either make them more motivated in product design, or they could have more passion to innovate during their

earlier years, and more laggard the longer they stay in the firm. Therefore the years worked in the enterprise are a secondary factor to consider.

“The performance of the employees gradually increases with their experience and after an experience of 20 years the performance decreases. In the early stages of doing a job, there are many things to learn and individuals are curious to things and they will show interest on the job. But, when everything has been explored, repeating the same job again and again, gives the sense of boredom in the minds of the employees and this might affect their performance negatively” (Kotur & Anbazhagan 2014, p.6).

5.3 Product Design Strategies Used by Textile MSEs

The first objective of the research was to identifying which type of strategies were employed by the textile MSEs in Nairobi City, and also find out if a variation in the use of product design strategies exists and is significant. Design is planning to meet a customer’s need, and involves creative processes that lead to innovation. The difference between one Textile MSE and another may be a difference in competencies, planning, creativity, innovation, production and marketing while being sensitive to political, economic and social factors. These activities have been defined by Browning et al. (2006) as organized, related activities working to create a product of value.

Prior studies done on textile MSEs have mentioned low product differentiation and imitation as the prime design constraints (Price, et al., 2013, Wandaka & Ngige, 2011). This suggests a possible challenge in the enterprises’ product design strategies.

The results (as shown in Table 4.1 and in Appendix G) show that the chi-square goodness of fit test is statistically significant for the strategies of; Support from associates and corporates (Association Strategy), ($\chi^2 (1) = 95.693, p = .001, p < .10$),

Collaboration with partners ($\chi^2 (1) = 47.222, p = .001, p < .10$), and Creation of new and different products (Diversification) ($\chi^2 (1) = 8.948, p = .007, p < .10$). The results were confirmed by the Monte Carlo Simulation Test. We reject the null hypothesis because the p-values of the three strategies are less than the predefined significance level ($p < .10$). This suggests that there is a variation in the types of product design strategies utilised by Textile MSEs in Nairobi City County.

The test findings revealed that the utilisation of PD strategies varies, with the majority employing Benchmarking, Originality, Technology and Research. However, a nearly equal number do not employ these four strategies. The Monte Carlo simulation (MCS) test was employed in this study to validate the 'Goodness of fit' results obtained from the Chi-square test, based on the premise that the Chi-square test would have considerable variances within categories. However, there were little differences in data frequencies within certain variable categories, such as; Benchmarking (Yes 83, No 70), Originality (Yes 78, No 75), Research (Yes 71, No 82), and Technology (Yes, 77, No 76). Another finding is that many MSEs did not employ the strategies of association, collaboration, and diversification.

The sub-sections that follow interpret and discuss the design strategy preference by the textile MSEs in Nairobi City.

5.3.1 Benchmarking Strategy.

Out of the seven design strategies used, benchmarking was found to be the one used most by the Nairobi MSEs in the Textile industry and also the most preferred, as indicated in the rank preference data. It was the first-choice category preferred strategy

by the textile MSEs at 55.6%, with the score supported by 85 enterprises. The employment of benchmarking strategies is a positive trend that is supported by Zeinalnezhad et al. (2011), who argue that in order for SMEs to compete in globalized and turbulent marketplaces, they must measure themselves against the best in the industry. Despite being the most used by the Nairobi textile MSEs studied, a large portion (45.8%) of the enterprises did not select it when asked. The researcher expected the affirmation score to this question to be higher, considering that past studies have reported stiff competition associated with copying/imitation of product designs. Copying is a result of wrong Benchmarking. The right benchmarking is where an enterprise learns from the competitor to develop their own unique product.

Even though we see a high preference for benchmarking among the Nairobi textile MSEs surveyed, the benchmarking process is usually not fully applied. This may be attributed to scarce labour force and limited finances. Benchmarking is well known in business, particularly among large businesses, although it is less known and employed by SMEs, according to Carpinetti and Oiko (2008). Cassell, Nadin and Gray (2001) emphasize that benchmarking actions designed for SMEs must be tailored to their unique setting and limitations.

This study found out that of the seven selected design strategies used by the MSEs, Benchmarking (comparison with high performers) in the textile industry, was the most preferred at 54.2%. In order to recognize and attain quality, comparison with high performers is one of the surest techniques to build a competitive edge within the textile design SMEs within Nairobi City County.

The benchmarking strategies comprise of actions such as; identifying a crucial procedure that has to be improved, as well as an organization that excels at it, contacting the organization that is to be benchmarked; visiting them, and studying the process or activity, and analysing the data in order to improve the critical process at one's own organization. All of these factors contribute to effective benchmarking of a product, process, or unit inside a company. This is because in order to recognize and attain quality, comparison with high performers is one of the surest techniques to build a competitive edge within the textile design SMEs within Nairobi City County. This statement concurs with D'Acosta, Melgarejo and Mercer-Blackman (2013), discovered that one of the potential benefits of a benchmarking-for-growth framework is information exchange of policies and productivity performance indicators.

No company should make alterations to its products, procedures, or organization unless the changes are beneficial (Kuznets, 2015). When adopting benchmarking approaches, an enterprise must consider how value chain procedures are carried out.

5.3.2 Originality Strategy

This study asserts that it is the designer's task is to produce something appealing within the restrictions of what is accessible and possible, while considering business strategy. This is attributed to designers' unique ability to integrate cultural information with requirements and style; which are then translated into consumer-friendly products. For example, Designers can use new resources to manufacture new and unique products that are professionally designed with the customer in mind. The research revealed that the Originality strategy came second to Benchmarking strategy, with 51% of the enterprises using originality. The desire to have unique competitive products propels

enterprises to adopt an originality strategy. However, due to the MSE limitations in resources, they preferred a benchmarking strategy which was associated with copying/imitation, with most of the design ideas being introduced by customers.

The discussion in section 5.2 noted that demographic factors enhance or mitigate constraints in product design. For example, the study found that the relationship between enterprise age and education age was positive and significant to product design. While textile designers have the ability to introduce designs in a flexible manner, they must consider the needs of their customers in order to design appropriate solutions for them. Personal experiences and requirements of clients, as well as enterprise capability and skill, will be taken into account while developing original designs.

Enterprises that will be successful in their product design activities will be those that understand social, cultural, economic and political elements in order to be creative and innovative in the creation of original products. To create a usable product, the creative textile designer should address the needs of the client, finding a balance between what the customer values and the designer's introduced distinctive and functional product attributes. In the stage-gate model of product design and development, Product design origination is recognized under the ideation, which is the first stage. The other stages are Concept Development, Design and Build and finally Launch (Kerber et al., 2007). The purpose of the ideation stage is to get a product idea that will result in a good business investment (Kerber et al., 2007). The stage gate process involves stages of activities, analysis and outcomes/deliverables that are then passed on to a gate that evaluates whether the product development continues or is terminated.

The findings in this study agree with Mete (2006), who discussed the ways to develop originality. Mete noted that sources of inspiration are essential for originality, and that inspirations are useful in the creative stage of design process as well as research and planning stages. Finding the perfect source of inspiration, on the other hand, isn't enough to develop something completely unique. Designers can expand their pool of ideas by looking for new ways to observe old and familiar objects, as well as new ways to use old and familiar media. Therefore, multiple variables are considered in combination to create unique original products, just as was stated by Amabile and Pratt (2016) in the Componential theory of Creativity. A weak product design or innovation approach will most likely result in copying or imitation of a product already in the market.

The high percentage of imitation could be attributed to the type of Product innovation strategy the enterprises follow; this is a predominate 'Concentrated Application'. In brief, concentrate application is when a product is designed and created to meet the needs and wants of a particular type of customer. Kinuthia et al. (2014) observe that majority of MSEs in Kenya prioritized customer focus. The study reveals that enterprises agree that the customer's preference for a product has to be considered since the customer knows what they want. Here the customer prescribes and dictates the design which may have been copied from another customer/enterprise.

5.3.3 Technology Strategy

New technologies refer to contemporary equipment such as automation, which serve to optimise workflows, enhance precision, and minimise mistakes. By utilising

appropriate resources and specialised knowledge, micro and small enterprises (MSEs) have the ability to utilise online digital data for the purpose of analysing substantial amounts of customer data, market trends, and competitor actions. This can be achieved either through internal capabilities or by collaborating with external entities.

The use of new technology in the product design and development process in the textile MSEs was the third most used after benchmarking and originality. It was also the MSEs choice for the 3rd category preferred strategy, supported by 51.9% of the enterprises. The product design and development process utilizes new technology not only for speed but also for precision, by reducing on errors to give accurate measurements. Technology has allowed for quality research, collaboration and marketing opportunities. Technological developments have given textile designers new ways of looking at things and tools to use. This study on Textile MSEs in Nairobi found out that the use of technology is limited and does not achieve its full potential.

Designers' work is substantially aided by textile design software, which increases their potential and creativity. These software packages assist designers in testing a variety of textures, colours, and patterns in order to create the perfect designs, as well as assist in the sketching of backgrounds in concept boards, tools for repeating patterns, texture mapping, and product renderings (Kaystha & Sharan, 2017).

"Tech can be embedded in machines such as computers, mobile devices, textile factory machines, quality testing lab equipment, fabric printers. The technologies can be operated by individuals without detailed knowledge of the workings of them". (Apparesearch, 2019, p, 2)

Computer technology in the apparel sector adds significant improvement in productivity and quality. Kinuthia, Mburugu and Mulu-Mutuku (2014) noted that the majority of respondents stated that they had never used E-marketing. According to the study, Kenyan garment-making micro-enterprises have yet to embrace the use of the internet. An apparel enterprise that adopts computer aided technologies will be able to achieve more efficient working conditions that will make them highly competitive in the garment industry (Kaystha & Sharan, 2017). This finding agrees with Builes (2015), who claims that technology is the primary driver of growth, with human capital investment coming in second. When globalization and Free Trade Agreements (FTA) call on enterprises from all sectors to be more productive and efficient, ICT and the trends relying on them can enable processes to be simpler and more agile in companies, as well as strengthen their skills to face increasingly demanding markets.

Thanks to technology, it is also now possible to digitize information and knowledge; besides, it is precisely internet that has permitted the convergence of data, audio and video services between different industries. These findings are also supported by Khatun and Murshida (2014), who note that this reflects actions and values that are responsible for the continuous improvement of the design for enterprise profitability, but also give a satisfactory service to the customer. New ideas coming out of innovation strategies help to improve quality by utilizing knowledge, technology, and mass customization to increase output while improving quality.

According to Jones (2003), computer technology is having a considerable impact on the way textiles are produced in more industrialised countries. Noting that designers have access to strong graphic software that offers them tools and procedures for

digitally developing their designs, as well as the ability to interact virtually with the industry. Consequently, this digital revolution has developed a growing market for enterprising designers and illustrators who also possess creative computing skills. Unlike what Jones (2003) reported in his study of Medium and Large enterprises, this study reveals that the textile design Micro and Small enterprises (MSEs) are left behind in the transformation of technologies.

5.3.4 Research Strategy

This study found that research activity is one of the strategies employed by the MSEs in textile design; it is the second-choice category preferred strategy by enterprises. Del Prado and Rosellon (2017) observe that R&D serves a strategic priority for almost every enterprise and country. They state and recognize that innovation is not a result of only R&D but is achieved through a wide range of activities. The kind of research done in the MSEs is not usually formal R&D, but is done informally and involves market survey (Market Intelligence), information inquiry, benchmarking and customer study. Paradoxically, even an imitation orientation requires knowledge of the character and process of creating the imitation product. In less developed countries, it's usual to copy existing common products or advancements that aren't patentable, and nevertheless, replications will require knowledge and skill for in-house innovative capabilities.

The finding on research strategy in this study concurs with Lynch (2013), who asserts that the creative process begins with the research of customer needs and aspirations, which are turned into ideas/concepts and eventually turned into products or services. This research found that out of four design idea sources, customer contribution was selected by the majority (85.6%). This indicates the characteristics of small enterprise which unlike large firms are limited by human and financial resources to engage in

elaborate R&D programmes (comprehensive strategizing, competitor benchmarking and review of literature). Due to the stated limitations, the small enterprise heavily relies on the customers for product concepts, making the MSEs susceptible to copycat behaviour (copying the competitor's designs), thereby escalating the market's imitation challenge. To mitigate against the "copying trend," enterprises need to be encouraged to acquire knowledge to generate original concepts and create unique new textile products. The CToC and the C-K theory introduced in this study have illustrated how external knowledge is used in the creative and innovation process, which entails that enterprise need to do research and get information from the external environment (customers and competitors) for effective product development. The study revealed that 64.7% of the enterprises acquire customer information, and 43.2% have adequate information about their competitors.

Being aware of PD external company elements, also known as Market orientation entails a significant amount of customer and competitor information. Market orientation, according to Kamyasup, Ntaysup, and Ahiauzusup (2010), involves much more than merely being oriented toward customers and competitors; it also includes acquiring appropriate knowledge and effectively managing that knowledge.

Higher levels of competitive advantage can be attained by an enterprise by implementing sound knowledge management, which entails information acquisition, dissemination, and response, as well as a market orientation that places the customer and competition at the center of focus (Kamyasup et al., 2010). According to the findings of a study conducted by Morgan, Obal, and Anokhin (2018), having a higher ability to integrate external knowledge and utilize it for commercial purposes improves

the association between customer participation and new product performance. The market orientation strategy of a company is based on research that allows it to stay up with market trends such as technological advancement and globalization. The market fosters the development of new approaches and techniques for producing unique textile design products. To address this requirement, strategies, techniques, and tools that help to logically systematize the creative process are required. This can be accomplished effectively through research.

According to this study, designers tend to research about design knowledge through practice rather than via theoretical discourse, as asserted by Barbara (2017), who observed that one of the characteristics of the fashion industry is that products become obsolete quickly. This is not due to the materials wearing out, but rather to consumers' constant desire for change. Customers' desires are mostly driven by social factors, hence fashion is often regarded to be very fast-moving. The pace at which fashions change indicates that the time to do formal research is rarely available to the MSE designers. This finding contradicts Fontell (2017), who states that modifications or incremental changes of discarded textiles as raw materials for new products depends strongly on employees' willingness to learn. Small alterations or incremental adjustments might refer to previous goods, processes, or technology developed by the enterprise. Incremental improvements in the manufacturing process, for example, can improve efficiency and save costs. 'Learning by doing' is a related concept that suggests that continual practice and minor innovations can lead to incremental productivity gains in an enterprise. Incremental innovation and 'learning by doing' would require the firm's personnel to make creative efforts in the development of in-house innovations. This will include RBV and DCT approaches, which make internal considerations that can be

leveraged to build a lasting competitive advantage and are best suited to supporting in-house innovations.

5.3.5 Other preferred Product Design Strategies

Despite the three discussed strategies above being the most preferred, it is noted that they are not used in isolation but in combination with other strategies. The following sub-sections provide discussion of other preferred design strategies in order of their popularity.

5.3.5.1 Product Diversification and Differentiation

Product diversification is the practice of modifying a current market product by adding value in order to expand the potential market of the enterprise and retain customers or lure new customers. It is also when the product design is altered to offer new products to existing customers, while differentiation as Kukartsev et al. (2019) explained is an approach that focuses on creating unique products which should differ from the products of competitors. Diversification and Differentiation are strategies for sustainability and competitive advantage.

As had been mentioned earlier, a market with diversified products is a vibrant one, giving clients a wide ‘choice of change’; additionally, a vibrant market is able to secure and create more jobs. Wandaka and Ngige (2011) mention low-key product diversification as one of the challenges faced by MSEs. They suggest that ‘Innovative product designs’ and ‘Product diversification’ are among the strategies textile and apparel businesses in Nairobi need to adopt for better performance.

Differentiation is the process by which an enterprise seeks to develop and market unique products for various client segments. Dirisu, Iyiola and Ibidunni (2013), state that a differentiation of new products approach would give companies more leeway to manufacture products with more valuable, desirable attributes. The findings also agree with Raj and Arindin (2014), who state that firms that pursue differentiation strategies achieve superior profits. As the environment in developing countries changes as a result of growing urbanization, the textile industry as a social system must be able to adapt to these changes through integrated acts of observation, learning, and changing interactions. Adaptability focuses on proactive behaviours such as production of more new products, rather than simply being limited in a conceptual sense to a few new behaviours. Thus, such strategic adaptability is regarded as a source of competitiveness and success.

Product Diversification and Differentiation both require the designer to have adequate information about the competitor and the customer. This study on MSEs revealed that 43% of the enterprises were always aware of their competitors and had adequate information about them. Majority (over 70%) of the Textile MSEs in Nairobi believed they were; more innovative, better risk takers, more competitive and 56% believed they were quicker in introducing new designs in the market.

There is plenty of room for Textile MSEs to improve their use of Product Design and Development Strategies. In particular, the diversification strategy was found to be the 5th most commonly used strategy (37.9%) out of the seven strategies studied. When ranked, Diversity was 6th with 26.5% popularity in the 1st choice category. It was 2nd

with 38.2% popularity in the 2nd choice category and also 2nd with 35.3% in the 3rd choice category.

5.3.5.2 Collaboration with Partner Enterprises

Collaborative creation or co-creation is a common trend in product development where team participation encourages multiple opinions and sharing of tasks. This statement is supported by Santis (2018), who also mentions that collaboration strategy encourages learning and helps reduce errors. Product design and development which involves creative activities encourages risk taking and experiments that eventually lead to successful innovations.

It is rare for MSEs to carry out experiments, mainly because their characteristics present challenges in human and finance resources. The internal 'deficiency' to meet their target necessitates the development of new partnerships/collaborations. These kinds of partnerships can be referred to as horizontal linkages, describing the relations between firms offering similar goods and services (Reeg 2015). It is usual for firms that get an order they cannot fulfil to subcontract with a horizontal link collaborator they trust.

This finding agrees with Libânio and Amaral, (2017) who say that increasing the degree of collaboration between different organizations to aid the design process is one of the strategies that could potentially have an impact on design. The innovation process in sustainable design is likely to be significantly more fruitful in terms of producing new ideas and concepts when working with people from diverse domains of expertise or with different points of view. Collaboration with other partners enhances the amount of information and knowledge that goes into the process, which aids in the discovery of

better solutions and the avoidance of errors. Having said that, designers frequently collaborate with customers to improve the end product's functionality in real-world situations.

Lotterberger (2012) found that Italian traditional textile SMEs did not always have the right internal competencies and profiles to manage design-driven innovation. The management (often family-run in most MSEs) is in charge of launching new products, which receives external input from sales representatives and requires specific research through empirical tests from R&D advisors. This collaboration between the R&D and sales consultants leads to high performance in the textile SMEs in Italy.

This finding is also shared by Möller (2017) who points out that future-oriented value creation requires multi-party cooperation within complex networks and will result in radical shifts in traditional value systems. Collaborations enable the creation of diverse types of new knowledge, and the collaborators have a better chance of identifying emerging opportunities than highly specialized actors (Möller & Rajala, 2007)

According to this study, future-oriented value creation will include opportunities to develop new activities and implement radical systemic change. As a result, new future-oriented value understanding intends to improve the level of production in MSEs in textile design and consumption in general, therefore offering benefits for sustainable development.

5.3.5.3 Support from Associates

Networking is a process that encourages the exchange of knowledge between individuals or groups, typically in an informal group environment. In this study Association strategies included networking strategy and alliance strategy with 10.5% using it as compared with the other strategies.

The purpose of an Association strategy is for social, professional or business links, collaborations and support. Chell and Baines (2000) observe that a large proportion of owner-managers rely on their own contacts for useful additional information. Networking involves social processes in addition to the normal economic trading relationship, hence necessitating the need for "trust," without which networking activity would be impossible (Chell & Baines, 2000)

Personal and professional networks are influential in MSE establishment and performance (Reeg, 2015). "Empirical research has shown that the economic success of MSE's in many countries depends on informal personal networks" (Abeka, 2011, p. 181). Association with outsiders or external environment players is an effective strategy for obtaining necessary resources for MSEs. Abeka (2011) identifies the external relationships as entrepreneurial networks.

Association as a strategy should be undertaken with companies and individuals who can provide support in the product design and development process, but also with companies and experts in secondary support areas like business management, business finance and marketing. Skill competence acquisition and upgrade greatly benefit from association. It is a way of development without reinventing the wheel.

5.3.5.4 Product Design Process Factors

Apart from the specific product design strategies studied, a number of factors influence the choice and application of the strategy by the textile MSE. Two highlights of the findings indicate that; (a) acquiring skilled personnel and improving in-house skills were important for design skill upgrade in the enterprise with majority 94.0% agreement supported by 140 respondents. (b)The product design work was consumer/client oriented with majority 91.9% agreement supported by 102 respondents who followed a two-step chain (Customer brings design idea or selects design then the Product is created). This was confirmed by a follow-up question as to whether the customer was the source of the design idea 85.6% (131 respondents) were in agreement that the customer decides on the design.

The following null hypothesis was put forward; *H₀₁: There is no variation in the type of product design strategies used amongst the textile MSEs in Nairobi City County, Kenya.* The hypothesis was tested using the Chi-square test that showed that there were significant variations in the use of product design strategies. Enterprises reported significant variation in the use of the following three strategies; Support from associates (10.5%), Collaboration with partners (22.2%), and Creation of new and different products (37.9%). A Chi-Square Goodness of Fit Test was performed to determine whether the proportion of strategy used was equal between textile MSEs. The proportions did differ for Association strategy ($\chi^2 (1) = 95.693, p = 0.00, p < .05$), collaboration strategy ($\chi^2 (1) = 47.222, p = 0.00, p < .05$), and New-different-products strategy ($\chi^2 (1) = 8.948, p = 0.003, p < .05$). This implies that we can reject the null hypothesis and conclude that there are variations in the use of product design strategies

in the textile MSEs. This means that more Textile enterprises need to improve their use of the three strategies.

5.4 Textile Product Performance

The section comprises five sub-sections; Product innovation performance, Constructs related to performance, Intrapreneurship orientation, Design management and product design challenges.

5.4.1 Product Innovation Performance

The age of internationalisation and intense market competition, Small and medium enterprises still require innovation to improve their performance. According to Jalil et al. (2021), studies have shown that innovation aptitude is a critical driver for manufacturing industries' survival. The findings of a study by Jalil et al (2021) indicated that SME performance benefits significantly from innovation capability.

The World Intellectual Property Organisation (WIPO) in its Global Innovation Index ranks the innovativeness of over 130 countries in different regions of the world (WIPO, 2020). It reports that Kenya ranked second (2) in innovation after the combined group of South Africa and Mauritius in sub-Saharan Africa in 2020, while in 2021 it ranked third (3) after Mauritius and South Africa (WIPO, 2021). An analysis of innovation performance at different income levels in the year 2020 gives Kenya an "above expectations for level of development" in the Lower middle-income group countries. Kenya's rating in the innovation performance analysis is as a result of "high expenditure in R & D and use of information and communication technologies (ICTs) and organizational model creation"(WIPO, 2020. p. 8). The above positive trend emanates

mainly from the medium and large organizations. It is the researcher's wish that the innovation culture of these organizations can trickle down to the textile MSEs.

The ability of MSEs to innovate is noteworthy because innovation provides a competitive advantage to enterprises, industries, and, ultimately, economies (Walobwa, Ngugi & Chepkulei, 2013). Fitriany and Abidin, (2018) explain that the competence of the manager has a strategic role in the success of the enterprise, especially the advantages of product differentiation. Fitriany and Abidin, (2018) further emphasize access to information, education and training as factors building competencies needed for competitive advantage. Denti (2014) gives three frequent measures of innovation as; product/technological measures, financial measures and subjective measures. It has been observed that only one in four new product development (NPD) projects is successful, indicating that enterprises must understand how to identify and nurture new product enablers (Evanschitzky et al., 2012).

5.4.2 Constructs Related to Performance

In order to understand the performance of the enterprises better, some of the factors that influence the effective creation of the textile end products were studied. These factors included the enterprises Product Design Targets, the Design Management Approach, The Product Origination orientation, Knowledge Management, Design Skill Upgrade orientation, Market Intelligence for Design, and Product Design Barriers. All these constructs have a bearing on the CTOC and C-K theories from which the conceptual framework of this study is derived. The innovations which were the end products from the textile MSEs are considered successful when the independent variables are

processed/ managed well in a conducive environment. Neely et al. (2000) agree that not only action (process) but also the end result of an action (product) defines performance.

5.4.2.1 Product Design Targets

A product design target is the agreed result of the product planning phase in a product design and development process. Ulrich and Eppinger (2008) state that the product planning process needs to be done early before substantial resources are allocated and that “product development projects support the broader business strategy of the company” (Ulrich & Eppinger. 2008, P.54). Sixty two per cent (62%) of the textile MSEs accomplished their set product design targets.

Micro and Small Enterprises must have a strategy for new product development when setting targets. Financial resources, technical resources, human resources, and market intelligence will all be taken into account. Mital et al. (2008) state that while reviewing their set target, enterprises need to ask themselves the following question; “What product concepts are within the company’s ability to develop and are attractive to its customers?, What are the risks are and can they be spread by diversifying product portfolio?” (Mital et al., 2008, p. 25). “The planning process considers many PD opportunities identified from many sources including; suggestions from marketing, Research, Customers, PD teams and benchmarking of competitors” (Ulrich & Eppinger, 2008, p.54). From the above it can be noted that to develop successful products, both internal and external factors are considered as spelt out in the RBV, DCT, CToC and the CK theories which are sensitive to concept and product development.

5.4.2.2 Product Design Knowledge Management

The study sought the enterprises' orientation towards acquiring and sharing new knowledge for product design and development. Sixty three per cent (63%) of the managers said that both Manager and Employees were encouraged to acquire knowledge, while 23% of the respondents said that only the manager was encouraged to acquire product design knowledge. Twenty three per cent (23%) of the enterprises reveal a negative situation where the employee's lack of knowledge may curtail the enterprises' product design performance. For good teamwork all members should have sufficient knowledge to identify flaws and also to assist in idealisation and design amendments. Sixty seven per cent (67 %) of the enterprises encourage the manager and employee to share their acquired product design knowledge with team members. Twenty four enterprises (18%) did not encourage the employee to share design knowledge.

Knowledge can determine whether an SME will perform in a competitive business environment. According to Sáenz et al. (2009), knowledge sharing is key to enhancing the innovation capability of enterprises. The type of knowledge sharing varies and depends on the innovation capability dimension being considered and on the technology intensity of the enterprise. According to Tassabehji et al. (2019), the knowledge sharing process in MSEs reveals more evidence of the use of donated knowledge, but limited evidence of Knowledge collection/research.

5.4.2.3 Product Design Skill Upgrade

Sixty three point nine (63.9%) managers indicated that both they and the employees were encouraged to 'keep their design skills up to date'. Twenty three per cent (23%)

of the enterprises did not encourage their employees to ‘keep their design skills up to date’.

This study revealed that acquiring skilled personnel and improving in-house skills was a top priority of textile MSEs (92.7%). Engaging external expertise was second at 80%. This inclination which involves collaboration and consultancy service is favoured as it has a high potential to introduce new concepts and knowledge. Only 69.5% of the enterprises consider offering design training after employment. This is an important aspect of design skill upgrade; however, many small enterprises cannot take advantage of comprehensive training due to constraints in human resource and finance. The MSEs carry out ‘on the job training’ and apprentice training. Thirty seven point seven 37.7% of the respondents consider employing foreign experts an important aspect of design skill upgrade.

Empirical studies have shown that having educated personnel and trained workers is beneficial in the workplace. Educated and skilled workers provide an enterprise with the potential to innovate and grow (Ayyagari et al., 2011). A high absorptive capacity amongst employees eases the process of internal reorganisation, technology adjustments, and uptake.

Low-skilled labour affects productivity and growth of MSEs. Therefore incentives for job training and management programmes can be part of a broad strategy to enhance small firms’ productivity and employment growth (Dutz et al., 2011). The dilemma is that most MSEs lack adequate time and resources to run training programmes for their unskilled workers. In addition, there is the fear that once trained the employee will be

taken by competitors offering slightly higher wages or other additional benefits (Hampel-Milagrosa, 2014; Loewe et al., 2013; Reeg, 2013).

According to Reeg (2015), since a majority of MSEs tend to exhibit highly personalised and informal management styles, employee relations strategies often follow the characteristics, personalities, and preferences of the business owner or manager. This implies that no matter the education or the skill the employee possesses, it will be up to the manager to nurture the human resource by providing an enabling work environment for the enterprise to thrive.

5.4.3 Intrapreneurship Orientation

MSEs are micromanaged because of their size; the manager who usually is the owner plays a pivotal role in all decisions in the business. The sustained commitment by the leader is critical for the success of organization innovation. A leader can influence the success of the organization, because she/he is the controller of the vision and mission of the organization, as well as motivating employees to perform well (Hao & Yazdanifard, 2015). “Leaders play a significant role in shaping firms’ potential to generate innovations by encouraging an appropriate environment and making decisions that promote successful generation and implementation of knowledge” (Aragón-Correa, García-Morales, & Cordón-Pozo. 2007, p.357).

The researcher therefore found it necessary to consider the managers’ attitude towards product design and innovation. Thomas Kuczarski’s “Innovation Creed for Managers” (KICM) test introduced by Ambler (2014) was used to measure the managers innovation attitude. The KICM test stipulates that if the manager cannot say

"yes" to at least 10 of the beliefs, they are likely an obstacle to attaining high levels of product innovation. This is because the manager or/and owner has a leading role in providing a conducive work environment for product design and innovation. According to Amabile (2012, p.3) "Creativity should be highest when an intrinsically motivated person with high domain expertise and high skill in creative thinking works in an environment high in support for creativity". This study's findings indicate that the highest scored intrapreneural attribute at 94.7% for the creativity construct was the belief that an effective innovation mind-set inspire staff to perform better. The lowest scored (84%) belief was that the manager accepts failure as an intrinsic component of innovation. This can be attributed to the fact that since most MSEs have meagre resources for operation and experimentation, they avoid loss of resources including time.

An average of 132 respondents revealed a creativity priority score of only 90.3%. The ideal score should be 100%. The interpretation is that not all manager respondents believe in taking advantage of new situations to create new product designs. They also are not risk takers or open minded; this assertion is derived from their opinion on looking for new solutions and accepting failure in design and innovation. This can also be explained by their meagre resources.

There is a positive impact of product innovation on firm performance (Boachie-Mensah & Acquah , 2015); however, studies on the Kenya informal sector have shown that enterprises invest very little in innovation, but instead imitate each other's products and also imported products (Daniels, 2010; Lewa, 2003; Osanjo, 2012). Despite the above trend, this study found that most enterprise manager respondents believe that innovative

new products will lead to a successful enterprise. The intrapreneural attribute that was scored the highest at 94% for the innovation construct was the belief that innovative new products will help the enterprise's future success, while the lowest scored (80.2%) was the belief that new products innovations have more value than old products?. An average of 133 respondents revealed an Innovation priority score of only 86.2%. The ideal score should be 100%. The interpretation of the findings support research on trends by most MSEs to copy and create what already exists in the market. A possible reason is shying away from risks due to their limited resources.

Management support structures have been identified as crucial for successful innovation (Lawal et al., 2016). MSEs have highly individualized and informal leadership behaviours. Employee work strategies are frequently influenced by the personal qualities and interests of the company's owner or manager (Reeg, 2015). In small enterprises, the leader makes the key decisions in the innovation process (Vagnani, & Volpe, 2017). The manager is frequently in-charge of the launch of new products (Lottersberger, 2012).

According to Salavou and Lioukas (2003), the market-pull as well as technology-push arguments are outweighed by entrepreneurial-push, and it is primarily entrepreneurial orientation that favours radical product breakthroughs. Small firms productivity can be enhanced by broad strategies like better working conditions and management programmes (Dutz et al., 2011). In this study, the employee data collected indicated that 50% of the enterprises gave the work environment attributes an excellent score. We may infer from this rating average that the work environment at the textile MSE does not encourage product innovation or intrapreneurship.

5.4.4 Design Management

The work environment is a pertinent factor for product design and development. This study recognises design management as an intervening variable, a moderator that determines the performance of textile MSEs. The enterprise managers were asked to indicate and rank the design management process variables they deployed; Recognition, Motivation and Teamwork were at the top while Communication, Formality, and Delegation were listed in that respective order. However, the variance between the variables was not significant; all received a response in the 70% range.

Recognition was prioritized by 78.4% of the managers. The employees' opinion of their NPD work environment as regards employee performance "Recognition" revealed a below average score for both Excellent and Good, with only 46.4% and 39.2% of the respondent affirmations respectively. Recognition is synonymous with appreciation, which is a significant employee motivator and also cultivates a culture of self-improvement. "Recognition of achievements by employees is highly motivating." (Mohamad & Chia, 2018, p.42). Dabawala (n.d, p.1) notes that "appreciation is one of the most powerful tools to motivate anyone but the fact is it's the least used tool in workplaces."

Teamwork was prioritized by 77.8% of the managers. Employees' opinion of their NPD work environment as regards their enterprise "Teamwork spirit" revealed a low score for both Excellent and Good, with only 53.6% and 39.2% of the respondent affirmations respectively. Good teamwork is enhanced by sufficient knowledge to identify flaws and also to assist in idealisation and design amendments. According to George (2007), teamwork fosters collective endeavours and divergent opinions and perspectives,

meaningful dissent, and distinctive contributions that allow for the achievement of true synergies and creative approaches.

Motivation was prioritized by 77.8% of the managers. Employees' opinion of their NPD work environment as regards their enterprise "Freedom to initiate new Product Designs" revealed a low score for both Excellent and Good, with only 58.2% and 29.4% of the respondent affirmations respectively. Motivation is a form of encouragement that can improve employee and company performance. Work motivation has a strong influence on employee performance in an enterprise (Amri & Ramdani 2021). Amabile (2012) recognized that motivation is a crucial factor for creativity as stipulated in the Componential Theory of Creativity. Apart from Teresa Amabile's theory, several theories support the need for motivation in a firm, including the following two:

Herzberg's Two-Factor Theory states that intrinsic motivators tend to create motivation when they are present, whereas the absence of extrinsic motivators tends to reduce motivation in the firm. Intrinsic motivators are more emotional needs, such as, recognition, relationships, and growth potential. Extrinsic motivators are more tangible, these include basic needs, such as status, job security, salary, and fringe benefits (Godspower, 2015).

The other theory, Equity Theory of Motivation, developed in the early 1960's by J. Stacey Adams, acknowledges that motivation can be influenced by the individual perception of fair treatment in an environment. A person's beliefs in regards to what is fair and what is not fair can affect their motivation, attitudes, and behaviours (Godspower, 2015). Mohamad and Chia, (2018) explain that employee motivation is

one of the driving forces behind any organizational success where the human capital within said organization would be able to function at its best. Closely related to motivation factors is the availability of time for product design and development. Employees' opinion of their NPD work environment as regards their "Time Allowance for Research" revealed a low score for both Excellent and Good, with only 51.7% and 22.5% of the respondent affirmations respectively.

Communication was prioritized by 77.1% of the managers. However, the employees opinion of their NPD work environment as regards Internal communication revealed a below average score for both Excellent and Good, with only 45.8% and 43.1% of the respondent affirmations respectively. According to Green and Bonollo (2002), within an enterprise, the integration of many disciplines into product development must be visible and open to internal dialogue. Product development and design methods encourage integration and communication between different competencies. Janhager (2005) notes that communication is required for synergy in the design team, as well as understanding with stakeholders outside the firm.

Formality of operations was prioritized by 75.8% of the managers. The high score contradicts the findings of studies (for example, Berkel & Tarp, 2020) reporting very limited formality in MSEs. Despite most MSEs operating in the informal sector they still perform formal tasks like, having an organization structure that recognises the responsibilities assigned to the various workers. The enterprises also maintain work instructions and keep records.

Delegation of authority of operations was prioritized by 73.9% of the managers. The textile MSEs' low scores on employees encouragement of controlled risks was confirmed when information on the management's tolerance on mistakes was tabulated. The employees' opinion of their NPD work environment as regards their "Tolerance to Design Failures" revealed a very low score for both Excellent and Good, with only 38.0% and 26.0% of the respondent affirmations respectively.

Other design management factors included; "Encouragement to learn and keep knowledge". The employees' opinion revealed a low score for both Excellent and Good, with only 50.7% and 33.3% of the respondent affirmations respectively. Employees' opinion on "Encouragement for Design Skill Upgrading" revealed a low score for both Excellent and Good, with only 53.9% and 29.6% of the respondent affirmations respectively. Employees' opinion on "Keeping up with New Technology" revealed a low score for both Excellent and Good, with only 53.9% and 29.6% of the respondent affirmations respectively.

In a survey of the Textile MSE challenges, motivation was listed as one of the Constraints faced by employees in the textile enterprises NPD. The employees considered "Limited Motivation" as one of the top constraints to effective product design and development. 25.5 % of the employees and 2% of Managers indicated that lack of motivation/recognition within the job place hindered effective product design and development. Out of the solutions suggested for the product design challenges the least mentioned was for motivation in the enterprise. Very few (8.5%) employees suggested a solution and only 1.3% of the managers suggested solutions to the

motivation challenge, with the general suggested solution being recognition mention and award for good performance.

Despite the good ratings by the managers on their preferred design management strategies, the employees' opinion on the work environment and intrapreneurship orientation was the contrary. Overall, most (50%) employees of most enterprises indicated that their intrapreneurial environment was excellent, while 4.6% and 2.6% indicated that the environment was poor and very poor respectively. The enterprises suggested solutions to the challenges of the work environment, including building good communication and teamwork. This was stated by 3.9% of managers and 5.9% of employees participating in the survey. The scores for Formality of Process and Delegation were low. This could be interpreted as a result of the characteristics of the MSEs, where the managers and owners are in control and handle most of the tasks by themselves.

5.4.5 Product Design Challenges

The textile MSEs performance is slowed down by various challenges. A report by KAM (2018) indicates that low levels of innovation as well as product development are two of the concerns of SMEs in manufacturing. The managers and the employee data indicated similar concerns in the ranking of the constraints from Creativity and Design, Resource, External Factor and Expertise/Skill. However, the Manager and Employee responses for Work Environment and Motivation challenges had a high variance. This could mean that managers did not have much of a problem with the work environment, while the employees were frank in explaining the actual situation.

The constraints mentioned in the creativity challenge category included a lack of design skills, limited time, copying and imitations, low intrapreneurship (fear of failing), design not being prioritized by the enterprise, and limited cooperation/collaboration among designers. The top concerns of the managers in regards to the challenges in creativity was the lack of design skills. (49.7%), while for the employees it was the limited time for design activities (30.7%) closely followed by lack of design skills (29.4%). The reasons for the creativity challenge include the fact that most individuals learn design skills on the job, and because the improvements are subtle (Incremental innovation), they don't cover a large variety of skills. This could also be due to the MSEs' limited human capability and financial resources, which provide no time for training or experimentation. Most of the solutions suggested by the employees were for the creativity and work environment challenge categories. There was a distinguishable difference in the number of suggestions given by managers and employees on solutions to the work environment challenge. This suggests that the employees were more affected by the challenges of the work environment, while the managers did not give it much priority. The work environment and the design management factors both play a role in the challenges that the MSEs experience. This suggests that paying attention to the intervening variables, particularly Design management, is critical for a textile MSE to achieve good performance.

5.4.5.1 Product Imitation Status

Imitations on product designs have been among the challenges facing the enterprises. An imitation orientation in an enterprise does not favour product innovation, which is a creative process requiring 'thinking outside the box'. Textile MSE limitations like; inadequate human capacity, poor design skills, a lack of funds, and a lack of time have

made some businesses engage in incorrect benchmarking (copying competitors' designs) and copying from publications (books, magazines, catalogues, and social media), the most prevalent way of copying is when a consumer prescribes and dictates a product they have seen from another customer or firm. A good practise is to use an existing product design as inspiration and a foundation to develop a new and unique product. A poor product design or innovation strategy will almost certainly result in the copying or replication of an existing product on the market.

This study proposes that textile MSEs may need to embrace innovative and effective product design strategies that will create product differentiation and not lead to imitation. They should also get assistance in protecting their original textile product designs from copying by patenting the designs.

5.5 The Influences of Product Design Strategies

The section comprises three sub-sections; product design strategies relation on performance, product design strategies relation to the componential theory of creativity, and product design strategies relation to the C-K theory.

5.5.1 Product Design Strategies Relation to Performance

Out of the strategies studied, Benchmarking appears to have gained prominence in many enterprises this observation is shared by writers like Kavanagh (2004) who states that the interest towards innovative textile design has increased due to more concern on issues such as aesthetic value and social function. Thanks to the closer collaborations with material engineers, chemists and industrial designers, there are valuable cases of hybridism, such as in materials and technology. Such cases attest to how

interdisciplinary collaboration is fundamental to innovation within textile design. Enhancement in the planning of various technology push (TP) and demand pull (DP) practices needs to be prioritized to meet the challenges of markets worldwide. It's also commonly recognised that manufacturing companies need to do a better job of managing certain TP-DP processes (Singla et al., 2018)

5.5.1.1 Interpretation of the Multiple Logistic Regression Test Results

Two of the seven product design strategies from the multiple logistic regression test results reported in section 4.5, stood out as significant amongst the other PD strategies as influencers of performance in this study on textile MSEs, namely Benchmarking and Research. Respondents who indicated 'yes' to using benchmarking and 'yes' to using research strategies in their business revealed that the two strategies were significant predictors of performance.

An interpretation of the Multiple Logistic Regression results presented in Table 4.16 and elaborated in Appendix F revealed that; the total number of respondents were 153 with no missing cases. This study's Omnibus test used to generate a Goodness of Fit confirmed an accurate reflection ($\chi^2 (7) = 31.245, p = .000, p < .05$). The Nagelkerke's (R^2), = 0.249 indicated a moderate relationship between the textile MSE design strategies and the performance. The Hosmer and Lemeshow test was used to determine whether or not the model accurately represents the data. The findings were ($\chi^2 (8) = 2.390, p = .967, p > .05$), indicating a good match because the p-value is more than .05. The classification Table indicated how successfully the model is able to predict the right category of the dependent output when the independent variables are included in the logistic regression analysis model. The model indicated a strong specificity and

sensitivity, with the model's accuracy of 69.9% (70%) and 79.8% (80%) correctly predicted to be innovative. The predictor variables research and benchmarking indicated the largest Wald statistics of 7.142 and 10.067, respectively. Suggesting they have a strong influence on the textile MSE performance. The test results indicated p-values of .008 and .002 for benchmarking and research, respectively, therefore confirming that the two independent variables strongly influence the textile MSE performance.

The odds of a Textile MSE creating unique/new innovative products (performance) as a result of increased use of the benchmarking strategy will not improve performance. Indicated by the test results, where the predictor variable coefficient value (β) was negative (-.997) with an odds ratio value of .369 at a 90% confidence interval (CI) of exponent (β). This means that benchmarking is beneficial to the performance of textile MSEs to a significant level (.008), but increased (intensive) use will most likely result in copying and imitation leading to few new product innovations. This suggests that for best performance, other strategies also need to be applied. The odds of a Textile MSE creating unique/new innovative products as a result of increased use of the research activity strategy will improve. Indicated by the test results, where the predictor variable coefficient value (β) was positive (1.291) with an odds ratio value of 3.637 at a 90% confidence interval (CI) of exponent (β). This means that research is beneficial to the performance of textile MSEs to a significant level (.002), and increased use of research will improve performance (new product innovations).

5.5.1.2 Interpretation of the UNIANOVA test results

The Levene's test of equality of error variance indicated unequal sample sizes, and because the test was statistically significant, the null hypothesis of equal population variances was rejected (p.10). Because the requirements of variance homogeneity were not met, the F-test does not require interpretation or reporting; rather, the effect of size needs to be stated (Berg. 2023b).

According to (Berg, 2023a) the basic rules of thumb for rating the effect size represented by the Partial Eta Squared (η^2) values of the ANOVA "Tests of Between-Subjects Effects", are that:

$\eta^2 = 0.01$ indicates a small effect; (1% - 5%)

$\eta^2 = 0.06$ indicates a medium effect; (6% - 13%)

$\eta^2 = 0.14$ indicates a large effect. (14% <)

Strategies that had a statistically significant (at 0.10 level. 90% CI) with a medium effect size, were:

- Benchmarking in combination with Diversification had an effect size influence of 0.132, this was a medium effect of 13.2% on the textile MSEs' product innovations.
- Originality in combination with Diversification had an effect size influence of 0.077, this was a medium effect of 7.7% on the textile MSEs' product innovations.
- Research had an effect size influence of 0.074, this was a medium effect of 7.4% on the textile MSEs' product innovations.

Strategies that had a statistically significant (at 0.10 level, 90% CI) with a small effect size, were:

- Originality had an effect size influence of 0.044, this was a small effect of 4.4% on the textile MSEs' product innovations.
- Benchmarking in combination with Collaboration had an effect size influence of 0.035, this was a small effect of 3.5% on the textile MSEs' product innovations.
- Association had an effect size influence of 0.033, this was a small effect of 3.3% on the textile MSEs' product innovations.
- Benchmarking had an effect size influence of 0.032, this was a small effect of 3.2% on the product innovations (performance) of textile MSEs.
- Collaboration in combination with Technology had an effect size influence of 0.028, this was a small effect of 2.8% on the textile MSEs' product innovations.

It can therefore be stated that none of the PD strategies employed alone or in combination had a large effect / influence on the textile MSEs' product performance, The Table 5.1 shows the top PD strategies or combined strategies with substantial effect on size of the independent variables on the dependent variable.

Table 5.1: ANOVA Effect Size Analysis: PD Strategies on Product innovation

Position	PD. Strategy	Effect size (Partial Eta Squared)	
1.	Benchmarking + Diversification,	13.2%	
2.	Originality + Diversification.	7.7%	Medium effect
3.	Research	7.4%	
4.	Originality	4.4%	
5.	Benchmarking + Collaboration	3.5%	Small effect
6.	Association,	3.3 %	
7.	Benchmarking,	3.2%	
8.	Collaboration + Technology	2.8%	
9.	Benchmarking + Research	2.0%	
10.	Research + Technology	1.0%	
11.	Collaboration + Diversification	0.9%	
12.	Collaboration + Research	0.8%	
13.	Diversification + Technology	0.5%	
14.	Technology	0.3%	

Source: Author, 2023

The following sub-sections discuss the ANOVA effect size ranking results, which are supported by crosstabulation test results. They are discussed in the following order, beginning with Research, Originality, Association, Benchmarking, and Technology. After addressing the influence and association effect of the individual PD strategies, the combination strategy approaches are addressed.

5.5.1.2.1 Research Activity for Innovation

To understand the kind of association between research and performance (innovation) a Chi-square test for independence was used. The innovation variable was split into two categories of not-innovative and innovative. MSEs that created six or less new products were labelled as non-innovative, and those that created seven or more new products were labelled as innovative. The interpretation on the association was guided

by the following null hypothesis H_0 *Research activities cannot be associated as an influencer to enterprises innovativeness/performance*. The data used was from 143 cases in the textile MSE study. A crosstabulation of the dichotomous variables indicated that 61.8% (55/89) of the sampled textile MSEs, that carried out research were associated with innovations, while 38.2% (34/89) of the sampled textile MSEs that did not carry out research, were associated with innovations, as shown in Table 5.2.

Table 5.2: Crosstabulation on Research and Innovation

Crosstabulation Using Dichotomized Measure for the Dependent Variable

		Innovations				Total	
		Not Innovative		Innovative			
		N	%	N	%	N	%
Research Strategy	Yes	14	25.9%	55	61.8%	69	48.3%
	No	40	74.1%	34	38.2%	74	51.7%
Total		54	100.0%	89	100.0%	143	100.0%

Crosstabulation Using Scale Measure for the Dependent Variable

			Product Innovations					Total
			None	1-3	4-6	7-9	10 or more	
Research Strategy	Yes	Count	2	7	5	3	52	69
		Expected Count	4.8	11.1	10.1	5.8	37.2	69.0
		% within Product innovations	20.0%	30.4%	23.8%	25.0%	67.5%	48.3%
	No	Count	8	16	16	9	25	74
		Expected Count	5.2	11.9	10.9	6.2	39.8	74.0
		% within Product innovations	80.0%	69.6%	76.2%	75.0%	32.5%	51.7%
Total		Count	10	23	21	12	77	143
		Expected Count	10.0	23.0	21.0	12.0	77.0	143.0
		% within Product innovations	100%	100%	100%	100%	100%	100%

Source: Author, 2021

To find out the significance of the association of research and innovation, the Pearson chi-square independence was used. The results shown in Table 5.3 indicate a value of 17.320 with a significant p-value of <.001.

Table 5.3:
Pearson chi-square Independence Tests on Research and Innovation

Chi-Square Tests ^c						
	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	17.320 ^a	1	<.001	<.001	<.001	
Continuity Correction ^b	15.913	1	<.001			
Likelihood Ratio	17.881	1	<.001	<.001	<.001	
Fisher's Exact Test				<.001	<.001	
Linear-by-Linear Association	17.199 ^d	1	<.001	<.001	<.001	.000
N of Valid Cases	143					

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 26.06.

b. Computed only for a 2x2 Table

c. For 2x2 crosstabulation, exact results are provided instead of Monte Carlo results.

d. The standardized statistic is -4.147.

Source: Author. 2021

The test results showed that the research data indicated a significant chi-square value $\chi^2(1, N = 143) = 17.320, p < .001$. Since the p-value is less than the chosen significance level ($\alpha = 0.10$), the null hypothesis was rejected and concluded that there is evidence to suggest an influence of Research strategy on an enterprise's innovativeness. Lambda test which is based on the proportionate reduction of error (PRE) approach was used as a strength association measure between the independent variable and the dependent variable (IBM, 2021b). Lambda test results are shown in Table 5.4, for the measure of association between Research and performance indicate that Lambda had a value of

.111 meaning a moderate association. Therefore we cannot use the independent variable (Research activities) as a sole predictor of Innovations (Performance).

Table 5.4: Research and Innovation _ Lambda Test

Directional Measures					
Lambda		Value	Asymptotic Standard Error ^a	Approx T ^b	Approx Sig
Nominal by Nominal	Symmetric	.220	.114	1.796	.072
	Research Strategy Dependent	.304	.114	2.266	.023
	Innovations Dependent	.111	.150	.699	.485

- a. When the null hypothesis is not assumed.
- b. Assuming the null hypothesis, the asymptotic standard error is applied.

Source: Author. 2021

The Lambda coefficient usually varies depending on the number of cases. However a Phi coefficient test stays the same despite the number of cases. To confirm the results of the Lambda test, the Phi coefficient and Contingency coefficient tests were applied; they gave a Phi value of- .348, (Moderate association needing verification) and Contingency coefficient of .329 (moderate association), as shown in Table 5.5. This is a confirmation that there is a moderate association between the independent and dependent variable. The conclusion is that the research strategy is a moderate predictor/ influencer to innovation within textile MSEs.

Table 5.5: Research and Innovation _ Phi and Contingency coefficient tests

Symmetric Measures			
		Value	Approximate Significance
Nominal by	Phi	-.348	<.001
Nominal	Cramer's V	.348	<.001

Contingency Coefficient	.329	<.001
N of Valid Cases	143	

Source: Author. 2021

Most textile MSEs are in the category of non-R&D-intensive companies, where most companies do not implement their innovation strategies based on formal R&D activities (Mattes, Zanker & Som, 2015). This is because of the informal MSE general characteristic of limited finance and resources (Stam & Wennberg, 2009), but in particular heavy reliance on customer driven design origination as was revealed in this study. Research in small firms can include the study or discovery of existing facts in the market/sector in order to improve product development and performance.

This is also supported by Hannah (2010), who found out that for achieving the psychological and functional utility of a textile product, the design technique should be updated in order to provide two life cycles for a single product. Moreover, throughout the design process, the designers must prepare for the transition from one life to the next. As a result, it can be concluded that the design of a product can take into account its second life. To create a product with a long life cycle, substantial research on long-term trends is required. A designer can use easy and convenient approaches to transition a product from its first to its second life. This leads to increased innovation (performance) within the enterprise.

5.5.1.2.2 Originality Strategy for Innovations

To understand the kind of association between Originality strategy and performance (innovation) a Chi-square test for independence was used. The interpretation on the

association was guided by the following null hypothesis H_0 *Originality cannot be associated as an influencer to enterprises innovativeness/performance*. The data used was from 153 cases in the Textile MSE study (Valid for the test were 143). A crosstabulation of the dichotomous dependent variable shown in Table 5.6 revealed that 44.9% (40/89) of the sampled textile MSEs that used the originality strategy were associated with innovations, while 55.1% (49/89) of the sampled textile MSEs that did not use the originality strategy were associated with innovations. The crosstabulation using the scale dependent variable indicated that those not using originality strategy had more innovations than those employing the originality strategy in the category of 10 or more innovations.

Table 5.6:
Crosstabulation on Originality and Innovation

Crosstabulation Using Dichotomized Measure for the Dependent Variable

		Innovations				Total	
		Not Innovative		Innovative			
		N	%	N	%	N	%
Original Strategy	Yes	35	64.8%	40	44.9%	75	52.4%
	No	19	35.2%	49	55.1%	68	47.6%
Total		54	100.0%	89	100.0%	143	100.0%

Crosstabulation Using Scale Measure for the Dependent Variable

			Product innovations					Total
			None	1-3	4-6	7-9	10 or more	
Original Strategy	Yes	Count	4	15	16	6	34	75
		Expected Count	5.2	12.1	11.0	6.3	40.4	75.0
		% within Product innovations	40.0%	65.2%	76.2%	50.0%	44.2%	52.4%
	No	Count	6	8	5	6	43	68
		Expected Count	4.8	10.9	10.0	5.7	36.6	68.0

	% within Product innovations	60.0%	34.8%	23.8%	50.0%	55.8%	47.6%
Total	Count	10	23	21	12	77	143
	Expected Count	10.0	23.0	21.0	12.0	77.0	143.0
	% within Product innovations	100%	100%	100%	100%	100%	100%

Source: Author. 2021

To find out the significance of the association between Originality and innovation, the Pearson chi-square independence was used and the results shown in Table 5.7

Table 5.7: Pearson chi-square Independence Tests on Originality and Innovation

Chi-Square Tests ^c						
	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	5.321 ^a	1	.021	.025	.016	
Continuity Correction ^b	4.554	1	.033			
Likelihood Ratio	5.382	1	.020	.025	.016	
Fisher's Exact Test				.025	.016	
Linear-by-Linear Association	5.284 ^d	1	.022	.025	.016	.010
N of Valid Cases	143					

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 25.68.

b. Computed only for a 2x2 Table

c. For 2x2 crosstabulation, exact results are provided instead of Monte Carlo results.

d. The standardized statistic is 2.299.

Source: Author. 2021

The test results showed that there was a significant association between Originality and innovativeness, $\chi^2 (1, N = 143) = 5.321, p < .025$. Since the p-value is less than the chosen significance level ($\alpha = 0.10$), the null hypothesis was rejected, and conclude that there is evidence to suggest an influence of Originality on an enterprise's

innovativeness/performance. According to Table 5.8, the findings for the measure associated with the Originality strategy and performance show that Lambda had a value of 0.000, indicating that no association was detected. Since the association was inconclusive, we cannot use the independent variable Originality strategy as a sole predictor of Innovations (Performance). This calls for another test on a different dataset to verify this Lambda result.

Table 5.8: Lambda Test on Originality and Innovation

		Directional Measures			
Lambda		Value	Asymptotic Standard Error ^a	Approx T ^b	Approx Sig
Nominal by Nominal	Symmetric	.074	.075	.957	.339
	Original Strategy Dependent	.132	.129	.957	.339
	Innovations Dependent	.000	.000	. ^c	. ^c

a. When the null hypothesis is not assumed.

b. Assuming the null hypothesis, the asymptotic standard error is applied.

c. Cannot be computed because the asymptotic standard error equals zero.

Source: Author. 2021

To confirm the results of the Lambda test, Phi coefficient and Contingency coefficient tests were applied; they gave a Phi value of .193 and Contingency coefficient of .189, as shown in Table 5.9, a confirmation that there is a moderate association between the Originality strategy and dependent Performance.

Table 5.9: Phi coefficient Test on Originality and Innovation

Symmetric Measures				
Value	Approx Sig	Sig	Monte Carlo Significance	
			90% Confidence Interval	
			Lower Bound	Upper Bound

Nominal	Phi	.193	.021	.026 ^c	.005	.047
by	Cramer's V	.193	.021	.026 ^c	.005	.047
Nominal	Contingency Coefficient	.189	.021	.026 ^c	.005	.047
N of Valid Cases		143				

c. Based on 153 sampled tables with starting seed 505061921.

Source: Author. 2021

The influence of originality on innovation had a small effect size (4.4%), and firms that indicated they did not employ it created a slightly more number of innovations. This is despite the originality advantage in the ability to differentiate items from the competition and attract new customers. This means that there are better ways to apply the originality strategy; for example, as proven by the ANOVA analysis output, combinations, such as originality plus diversity, produce superior results, with a medium effect size (7.7%). In addition, the majority of innovations are small improvements (incremental innovations) because many small enterprises have little means to generate a multitude of truly exceptional innovations (Lawal et al., 2016). Moreover, textile MSEs primarily focus on fulfilling customer-requested designs rather than creating their own unique products. Additionally, they do not prioritise the research and experimentation required for developing original items due to their resource limitations. Other strategy combinations, in addition to diversification, includes a research, because research is required to discover trends, gain knowledge, learn skills, and uncover inspiration that is relevant and appealing to the client. The collaboration strategy and association/networking strategy will have experts bringing fresh perspectives and helping open new avenues and originality.

Product designers and manufacturers that think outside the box and use an original approach can generate new markets (including niche markets) and create a strong visual identity, lasting impression, and consumer engagement.

5.5.1.2.3 Association Strategy for Innovations

To understand the kind of association between Association strategy and performance (innovation) a Chi-square test for independence was used. The interpretation on the association was guided by the following null hypothesis H_0 Association strategy cannot be associated as an influencer to enterprises innovativeness/performance. The data used was from 153 cases in the Textile MSE study (Valid for the test were 143). A crosstabulation of the dichotomous dependent variable shown in Table 5.10 revealed that 10.1% (9/89) of the sampled textile MSEs that used the Association strategy were associated with innovations, while 89.9% (80/89) of the sampled textile MSEs that did not use the Association strategy were associated with innovations. The crosstabulation using the scale dependent variable indicated that those not using Association strategy had more innovations than those employing the Association strategy in the category of 10 or more innovations.

Table 5.10: Cross tabulation on Association Strategy and Innovation

Crosstabulation Using Dichotomized Measure for the Dependent Variable

		Innovations				Total	
		Not Innovative		Innovative			
		N	%	N	%	N	%
Association Strategy	Yes	6	11.1%	9	10.1%	15	10.5%
	No	48	88.9%	80	89.9%	128	89.5%
Total		54	100.0%	89	100.0%	143	100.0%

Cross tabulation Using Scale Measure for the Dependent Variable

Product Innovations					
None	1-3	4-6	7-9	10 or more	Total

Association Strategy	Yes	Count	1	2	3	3	6	15
		Expected Count	1.0	2.4	2.2	1.3	8.1	15.0
		% within Product innovations	10.0%	8.7%	14.3%	25.0%	7.8%	10.5%
	No	Count	9	21	18	9	71	128
		Expected Count	9.0	20.6	18.8	10.7	68.9	128.0
		% within Product Innovations	90.0%	91.3%	85.7%	75.0%	92.2%	89.5%
Total		Count	10	23	21	12	77	143
		Expected Count	10.0	23.0	21.0	12.0	77.0	143.0
		% within Product innovations	100%	100%	100%	100%	100%	100%

Source: Author. 2021

The Pearson chi-square independence was used to determine the significance of the relationship between Association Strategy and Innovation. The test's results are displayed in Table 5.11.

Table 5.11: Pearson chi-square Independence Tests on Association Strategy and Innovation

Chi-Square Tests ^c						
	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	.036 ^a	1	.850	1.000	.529	
Continuity Correction ^b	.000	1	1.000			
Likelihood Ratio	.035	1	.851	1.000	.529	
Fisher's Exact Test				1.000	.529	
Linear-by-Linear Association	.035 ^d	1	.851	1.000	.529	.215
N of Valid Cases	143					

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 5.66.

b. Computed only for a 2x2 table

c. For 2x2 crosstabulation, exact results are provided instead of Monte Carlo results.

d. The standardized statistic is .188.

Source: Author. 2021

The test results showed that there was a significant association between Association Strategy and innovativeness, $\chi^2(1, N = 143) = .036, p = 1$. With the asymptotic sig as .850. Since the p-value is more than the significance level ($\alpha = 0.10$), the null hypothesis was accepted, and conclude that there is no evidence to suggest an influence of Association Strategy on an enterprise's innovativeness/performance. The Table 5.12, shows results for the measure associated with Association strategy and performance show that Lambda had a value of 0.000, indicating no association revealed. Since the association was inconclusive, we cannot use the independent variable Association strategy as a sole predictor of Innovations (Performance). This suggests for another test on a different dataset to verify this Lambda result.

Table 5.12: Lambda Test on Association Strategy and Innovation

		Directional Measures			
Lambda		Value	Asymptotic Standard Error ^a	Approx T	Approx Sig
Nominal	Symmetric	.000	.000	. ^b	. ^b
by	Association Strategy Dependent	.000	.000	. ^b	. ^b
Nominal	Innovations Dependent	.000	.000	. ^b	. ^b

a. When the null hypothesis is not assumed.

b. Cannot be computed because the asymptotic standard error equals zero.

Source: Author. 2021

To confirm the results of the Lambda test, Phi coefficient and Contingency coefficient tests were applied; they gave a Phi value of .016 and Contingency coefficient of .016,

as shown in Table 5.13, a confirmation that there was a weak association between the Association strategy and Product Innovation.

Table 5.13: Phi coefficient Test on Association Strategy and Innovation

		Symmetric Measures				
		Value	Approx Sig	Monte Carlo Significance Sig	90% Confidence Interval	
					Lower Bound	Upper Bound
Nominal by	Phi	.016	.850	1.000 ^c	.985	1.000
Nominal	Cramer's V	.016	.850	1.000 ^c	.985	1.000
	Contingency Coefficient	.016	.850	1.000 ^c	.985	1.000
N of Valid Cases		143				

c. Based on 153 sampled tables with starting seed 505061921.

Source: Author. 2021

The influence of association support on innovation was minor (Effect size of 3.3% from the ANOVA results). It can be noted from the crosstabulation that enterprises that reported they did not use an association strategy developed more innovations (89.9% of MSEs). This suggests that association strategy cannot be the sole predictor of textile MSE innovation.

Despite the little influence the results portray, textile MSEs connecting with like-minded professionals working in or for the same industry can benefit from leveraging association support and networking links. The networks provide significant collaboration opportunities as well as access to valuable knowledge and resources. Enterprises can obtain a competitive advantage and improve their product development process by embracing association strategy. Support from associations improves product design by promoting the exchange of valuable knowledge and expertise. The benefits of association to product design, includes learning from the successes and failures of others, remaining current on industry trends, and obtaining insights into customer needs. Applying such knowledge to the product design process ensures that offers are current, up to date, and meet the needs of the intended consumers.

5.5.1.2.4 Benchmarking for Innovations

To understand the kind of association between benchmarking and performance (innovation) a Chi-square test for independence was used. The interpretation on the association was guided by the following null hypothesis H_0 *Benchmarking cannot be associated as an influencer to enterprises innovativeness/performance*. The data used was from 153 cases in the Textile MSE study (Valid for the test were 143). A cross tabulation of the dichotomous variables shown in Table 5.14, indicated that 67.4% (60/89) of the sampled textile MSEs that carried out comparison with high performers in the same trade (Benchmarking) were associated with innovations, while 32.6% (29/89) of the sampled textile MSEs that did not carry out comparison with high performers in the same trade were associated with innovations.

Table 5.14: Cross tabulation on Benchmarking and Innovation

Cross tabulation Using Dichotomized Measure for the Dependent Variable

Nominal by Nominal		Innovations				Total	
		Not Innovative		Innovative		N	%
		N	%	N	%		
Benchmarking Strategy	Yes	20	37.0%	60	67.4%	80	55.9%
	No	34	63.0%	29	32.6%	63	44.1%
Total		54	100.0%	89	100.0%	143	100.0%

Cross tabulation Using Scale Measure for the Dependent Variable

		Product Innovations					Total	
		None	1-3	4-6	7-9	10 or more		
Benchmarking Strategy	Yes	Count	2	12	6	8	52	80
		Expected Count	5.6	12.9	11.7	6.7	43.1	80.0
		% within Product Innovations	20.0%	52.2%	28.6%	66.7%	67.5%	55.9%
	No	Count	8	11	15	4	25	63
		Expected Count	4.4	10.1	9.3	5.3	33.9	63.0

	% within Product Innovations	80.0%	47.8%	71.4%	33.3%	32.5%	44.1%
Total	Count	10	23	21	12	77	143
	Expected Count	10.0	23.0	21.0	12.0	77.0	143.0
	% within Product Innovations	100%	100%	100%	100%	100%	100%

Source: Author. 2023

To find out the significance of the association between Benchmarking and innovation, the Pearson chi-square independence was used and the results shown in Table 5.15

Table 5.15: Pearson chi-square Independence Tests on Benchmarking and Innovation

Chi-Square Tests ^c						
	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	12.584 ^a	1	<.001	<.001	<.001	
Continuity Correction ^b	11.382	1	<.001			
Likelihood Ratio	12.673	1	<.001	<.001	<.001	
Fisher's Exact Test				<.001	<.001	
Linear-by-Linear Association	12.496 ^d	1	<.001	<.001	<.001	.000
N of Valid Cases	143					

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 23.79.

b. Computed only for a 2x2 Table

c. For 2x2 crosstabulation, exact results are provided instead of Monte Carlo results.

d. The standardized statistic is -3.535.

Source: Author. 2021

The test results showed that the research data indicated a significant chi-square value $\chi^2(1, N = 143) = 12.584, p < .001$. Since the p-value is less than the chosen significance

level ($\alpha = 0.10$), the null hypothesis was rejected, and it was concluded that there is evidence to suggest an influence of Benchmarking on an enterprise's innovativeness/performance. Lambda test results for the measure of association between Benchmarking and Performance indicate as shown in Table 5.16, that Lambda had a value of 0.094 meaning a weak association. The 'Lambda Value Strength Range Guide' used to describe the strength is shown in Appendix, I. Since the association strength was weak, we cannot use the independent variable (Comparison with high performers in the same trade / Benchmarking) as a sole predictor of Innovations (Performance).

Table 5.16: Lambda Test on Benchmarking and Innovation

		Directional Measures			
Lambda		Value	Asymptotic Standard Error ^a	Approx T ^b	Approx Sig
Nominal by	Symmetric	.162	.109	1.407	.160
	Benchmarking Strategy Dependent	.222	.103	1.930	.054
Nominal	Innovations Dependent	.093	.140	.631	.528

a. When the null hypothesis is not assumed.

b. Assuming the null hypothesis, the asymptotic standard error is applied.

Source: Author. 2021

To confirm the results of the Lambda test, Phi coefficient and Contingency coefficient tests were applied; they gave a Phi value of -.297 (Moderate value that needs to be verified), and Contingency coefficient of .284, as shown in Table 5.17, a confirmation that there is a moderate association between the independent (Benchmarking) and dependent variable (Performance).

Table 5.17: Phi coefficient Test on Benchmarking and Innovation

		Symmetric Measures				
		Value	Approximate Significance	Monte Carlo Significance Sign	90% Confidence Interval	
					Lower Bound	Upper Bound
Nominal by	Phi	-.297	<.001	.007 ^c	<.001	.017
Nominal	Cramer's V	.297	<.001	.007 ^c	<.001	.017
	Contingency Coefficient	.284	<.001	.007 ^c	<.001	.017
N of Valid Cases		143				

c. Based on 153 sampled tables with starting seed 505061921.

Source: Author. 2021

Despite Benchmarking being a popular strategy for textile MSEs, the ANOVA test findings revealed a statistically significant but small effect size (3.2%) on the dependent variable. The Lambda score was weak, but the Phi coefficient value showed a moderate effect. Therefore the conclusion is that benchmarking together with other factors impacts textile MSE product innovations. The ANOVA test findings show that benchmarking paired with diversification and benchmarking combined with collaboration yielded higher scores than benchmarking alone. The effect sizes were 13.2% and 3.5%, respectively.

5.5.1.2.5 Technology Strategy for Innovations

To understand the kind of association between Technology Strategy and performance (innovation) a Chi-square test for independence was used. The interpretation on the association was guided by the following null hypothesis *H₀ Technology Strategy cannot be associated as an influencer to enterprises innovativeness/performance* The data used was from 153 cases in the Textile MSE study (Valid for the test were 143). A

crosstabulation of the dichotomous dependent variable shown in Table 5.18 revealed that 52.8% (47/89) of the sampled textile MSEs that used the Technology Strategy were associated with innovations, while 47.2% (42/89) of the sampled textile MSEs that did not use the Technology Strategy were associated with innovations. The crosstabulation using the scale dependent variable indicated that those using Technology Strategy had more innovations than those not employing the Technology Strategy in the category of 10 or more innovations. According to the findings, the difference in influence between using new technology and not using new technology was minimal.

Table 5.18: Cross tabulation on Technology Strategy and Innovation

Crosstabulation Using Dichotomized Measure for the Dependent Variable

		Innovations				Total	
		Not Innovative		Innovative		N	%
		N	%	N	%		
Technology Strategy	Yes	28	51.9%	47	52.8%	75	52.4%
	No	26	48.1%	42	47.2%	68	47.6%
Total		54	100.0%	89	100.0%	143	100.0%

Cross tabulation Using Scale Measure for the Dependent Variable

			Product innovations					Total
			None	1-3	4-6	7-9	10 or more	
Technology Strategy	Yes	Count	4	12	12	4	43	75
		Expected Count	5.2	12.1	11.0	6.3	40.4	75.0
		% within Product innovations	40.0%	52.2%	57.1%	33.3%	55.8%	52.4%
	No	Count	6	11	9	8	34	68
		Expected Count	4.8	10.9	10.0	5.7	36.6	68.0
		% within Product innovations	60.0%	47.8%	42.9%	66.7%	44.2%	47.6%

Total	Count	10	23	21	12	77	143
	Expected Count	10.0	23.0	21.0	12.0	77.0	143.0
	% within Product innovations	100%	100%	100%	100%	100%	100%

Source: Author. 2021

To find out the significance of the association between Technology Strategy and Innovation, the Pearson chi-square independence was used and the results shown in Table 5.19

Table 5.19:
Pearson chi-square Independence Tests on Technology Strategy and Innovation

Chi-Square Tests ^c						
	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	.012 ^a	1	.912	1.000	.524	
Continuity Correction ^b	.000	1	1.000			
Likelihood Ratio	.012	1	.912	1.000	.524	
Fisher's Exact Test				1.000	.524	
Linear-by-Linear Association	.012 ^d	1	.912	1.000	.524	.136
N of Valid Cases	143					

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 25.68.

b. Computed only for a 2x2 table

c. For 2x2 crosstabulation, exact results are provided instead of Monte Carlo results.

d. The standardized statistic is -.111.

Source: Author. 2021

The test results showed that there was a significant association between Technology Strategy and innovativeness, $\chi^2(1, N = 143) = .012, p = .012$. With asymptotic p-value of .912. Since the p-value is more than the chosen significance level ($\alpha = 0.10$), the null hypothesis was accepted, and conclude that there is no evidence to suggest an influence of Technology strategy on an enterprise's product innovativeness. Lambda test results

shown in Table 5.20, indicate a value of 0.000, indicating no association revealed. Since the association was indecisive, we cannot use the independent variable Technology Strategy as a sole predictor of Innovations (Performance). This calls for another test on a different dataset to verify this Lambda result.

Table 5.20: Lambda Test on Technology Strategy and Innovation Directional Measures

Lambda		Value	Asymptotic Standard Error ^a	Approx T	Approx Sig
Nominal by Nominal	Symmetric	.000	.000	. ^b	. ^b
	Technology Strategy Dependent	.000	.000	. ^b	. ^b
	Innovations Dependent	.000	.000	. ^b	. ^b

- a. When the null hypothesis is not assumed.
- b. Cannot be computed because the asymptotic standard error equals zero.

Source: Author. 2021

To confirm the results of the Lambda test, Phi coefficient and Contingency coefficient tests were applied; they gave a Phi value of -.009 and Contingency coefficient of .009, as shown in Table 5.21, a confirmation that there was a weak association between the Technology Strategy and dependent Performance.

Table 5.21: Phi coefficient Test on Technology Strategy and Innovation Symmetric Measures

Value	Monte Carlo Significance
-------	--------------------------

			Approx		90% Confidence Interval	
			Sig	Sig	Lower	Upper
					Bound	Bound
Nominal	Phi	-.009	.912	1.000 ^c	.985	1.000
by	Cramer's V	.009	.912	1.000 ^c	.985	1.000
Nominal	Contingency	.009	.912	1.000 ^c	.985	1.000
	Coefficient					
N of Valid Cases		143				

c. Based on 153 sampled tables with starting seed 505061921.

Source: Author. 2021

The New Technology strategy had a small influence on innovation (effect size of 0.3% based on ANOVA results). The crosstabulation shows that there was little variation in innovativeness between firms that used and did not use new technology. The Contingency coefficient test resulted in a value of .009, indicating a weak relationship between the independent and dependent variables. As a result, technology strategy cannot be regarded as the sole influencer of textile MSE product innovation.

Textile MSEs should embrace new technology used in combination with other strategies and also be sensitive to the mediating variable, design management, in order to remain competitive by developing creative and user-friendly products that differentiate themselves from their competition. Technology can be used at many stages of the textile manufacturing process, for example, to make design, production and marketing more efficient and effective. In the digital age, when technology is advancing at a rapid speed, businesses must accept change and harness new technologies to produce goods which resonate with customers.

The null hypothesis (*H₀₃ There is no significant influence of product design strategies on the performance of textile MSEs in Nairobi City County, Kenya*) was rejected, since there were influences of product design strategies on the performance.

5.5.2 Product Design Strategies Relation to the Componential Theory of Creativity

Product design relies greatly on creative and innovative factors in a workplace. One of the pillars to this research's concept is the CToC theory asserted by Amabile (2012). The theory stipulates that for creativity to thrive in an enterprise, three components, namely Expertise, Motivation and Creative Thinking skills have to exist and work together in a conducive environment. Figure 5.1 and Table 5.22 illustrate how the product design strategies fit into the CToC.

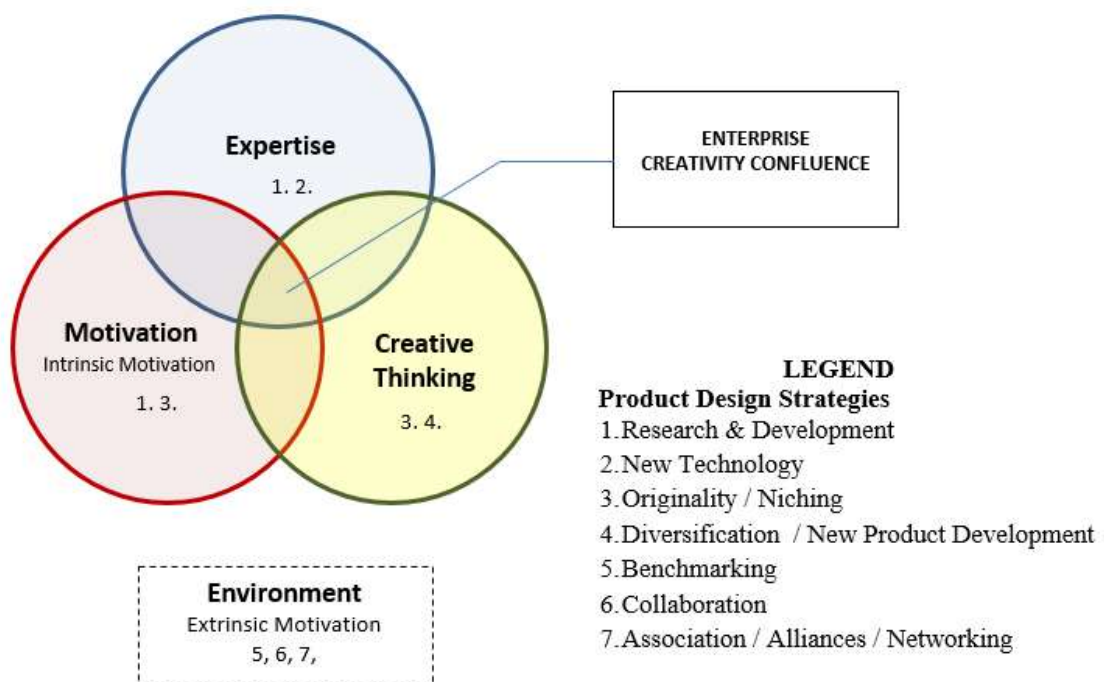


Figure 5.1: PD Strategy Relation to the CToC

Source: Author. 2020

Table 5.22: PD Strategies Relation to the CToC

The Relationship between PD Strategies and the Componential Theory of Creativity				
	Strategy	CToC Components	Orientation	Explanation
1.	Research & Development,	Expertise	Knowledge Orientation	Product innovation (performance) relies on R&D to promote expertise, a component of creativity. The expertise component can only be nurtured by an enterprise that is Knowledge oriented,

				where Knowledge acquisition and Sharing is encouraged.
		Motivation (Intrinsic Motivation)	Conducive work Environment	Successful R&D can only happen when the Employee/Designer/Intrapreneur is motivated. Requires a Design Management Style that creates a conducive work Environment
2.	New Technology,	Expertise	Knowledge Orientation	Embracing new technology strategies usually gives an enterprise a competitive advantage. An enterprise that is Knowledge oriented will enable the upgrade of Skills therefore indicating their sensitivity to the Expertise component. Singla et al. (2018) advocate that Technology push (TP) and demand pull (DP) practices need to be prioritized to meet the challenges of competent markets worldwide.
3.	Originality / Niching,	Creative Thinking	Intrapreneural Orientation	A competitive market place characterized by copying and imitation requires a strategy like Niching (Originality) to ensure less or no competition on similar products and/or same clients. Embracing intrapreneural orientation will allow for creative thinking where employees are allowed to design and innovate.
		Motivation (Intrinsic Motivation)	Conducive work Environment	A successful Originality / Niching strategy can only happen when the Employee/Designer/Intrapreneur is motivated. Requires a Design Management Style that creates a conducive work Environment
4.	Diversification / New Product Development (NPD)	Motivation (Intrinsic Motivation)	Conducive work Environment	Creation of new and differentiated products (Diversification) is achieved successfully when the Employee/Designer/Intrapreneur is motivated. Requires a Design Management Style that creates a conducive work Environment
		Creative Thinking	Intrapreneural Orientation	Embracing intrapreneural orientation will allow for creative thinking where employees are allowed to design and innovate.

5.	Benchmarking,	External Environment (Extrinsic Motivation)	Market Orientation	<p>Product design and innovation process begins with a situation/Market analysis in order to provide a fitting product for the client/market. Benchmarking can be said to be a comparison with high performers in the same trade for self-evaluation. A Market orientation stipulates sensitivity to Competitor and Customer dynamics. The extrinsic motivation will drive the enterprises innovation agenda.</p> <p>Popular quotes relating to the Benchmarking strategy includes: - “Do not reinvent the wheel” - “Learn not only from your mistakes but also from the mistake of others” - “Stand on the shoulder of giants”.</p>
6.	Association /Alliances / Networking	External Environment (Extrinsic Motivation)	Market Orientation	Association / Networking relates to linking and getting support from not only design and development but also support for secondary areas such as Marketing, Finance and Legal issues.
7.	Collaboration	External Environment (Extrinsic Motivation)	Market Orientation	Most innovation activities involve multiple actors, from situation analysis, planning/design and development. Findik and Beyhanb (2015) note that enterprises that engage in external collaboration for innovation are better placed to improve their products. When collaboration is carried out internally it is usually referred to as Teamwork.

Source: Author, 2020

Age of an enterprise is an intervening variable in the PD strategies relation to the CToC. Jajja et al. (2017) explain that acquisition of knowledge, resources, networks as well as interactions that have a positive influence on product innovations usually take time, therefore older firms are expected to have good performance (to innovate more effectively than newer firms). This study found the correlation between the age of enterprises and product design accomplishment to be positive and significant. Human resource capacity (number of employees) gives opportunity for intrapreneural activities and enhances the

work environment. This study found that the correlation between the number of employees and product design accomplishment was positive.

There is a positive relationship between formal education and productivity; however, both formal and non-formal education is recognized. Workplace training through specific activities such as research and innovation, networking and on- the- job non-formal training also contributes to education (Aladejebi, 2018). This study found the correlation between the variables to be positive and significant. The number of years one works in the same employment could either make them more motivated or more laggard. This study's correlation test between years worked in the enterprise by employees and awareness of product design strategies gave a negative result.

5.5.3 Product Design Strategies Relation to the C-K Theory

The selected design strategies can be mapped onto the design square as shown in Figure 5.2 and Table 5.23. The strategies are either used as an internal or external component of the C-K theory. These involve operators that capture the variety of design situations and the dynamics of innovative design.

2	Research & Development Diversification / New Product Development	Internal Concept	C → C	Expansion of existing Concepts (Internal) to generate new concepts. [By Partition or Inclusion]
3	Research & Development New Technology Originality / Niching Diversification / New Product Development,	External Knowledge	K → C	Expansion of existing Knowledge in the market (External) to generate new concepts. [By Disjunction/Partition/Validation]
4	Research & Development Benchmarking Collaboration Association / Alliances / Networking	External Concept	C → K	Existing concepts (External) used to create new knowledge [By Conjunction/Activation]

Source: Author, 2020

* These operators capture the dynamism of innovative design as well as the diverse range of design situations (Hatchuel & Weil 2003).

5.6 Proposed Product Design Strategy Guide for Textile MSEs

The section starts by introducing the PD strategy guide before illustrating and explaining the PDD model, the PD strategy Nexus, and the Product Design situation and Innovation Strategies

5.6.1 Introduction

Empirical evidence from the study reveals that the MSEs need assistance in tackling challenges in textile product design and development. In that regard the researcher introduces a “Product Design Strategy Guide for textile MSEs”. The top three PD challenges mentioned by the enterprise managers were; Creativity, Resources and External factors, while employees gave Creativity, Work Environment and Resources

as their top three PD challenges. Most of the design and development process challenges were in the Creativity / Design constraints and most of the enterprises solution requests were for this challenge. In regards to assisting the MSEs with their PD and creativity challenge, it is necessary to provide a guide/framework to be used by Product design and Development Advisors/trainers.

5.6.2 Product Design and Development Model

In developing ‘the product design strategy guide’ here referred to as ‘the Product Design and Development (PDD) Model’, the study recognizes that textile MSEs Intrapreneurs when given a favourable environment are able to effectively strategize on product design and development. Therefore in the middle of the model is the ‘Product design strategy Nexus’ which houses the coordination (Managerial/ Intrapreneural unit) of the Product Design and Development process.

In the illustrated Product Design and Development Model in Figure 5.3, the long single head arrows indicate the cyclic product development route, from Market, Design, and Production and back to the Market. The short double head arrows show the iterations between the design management and three components for product innovation.

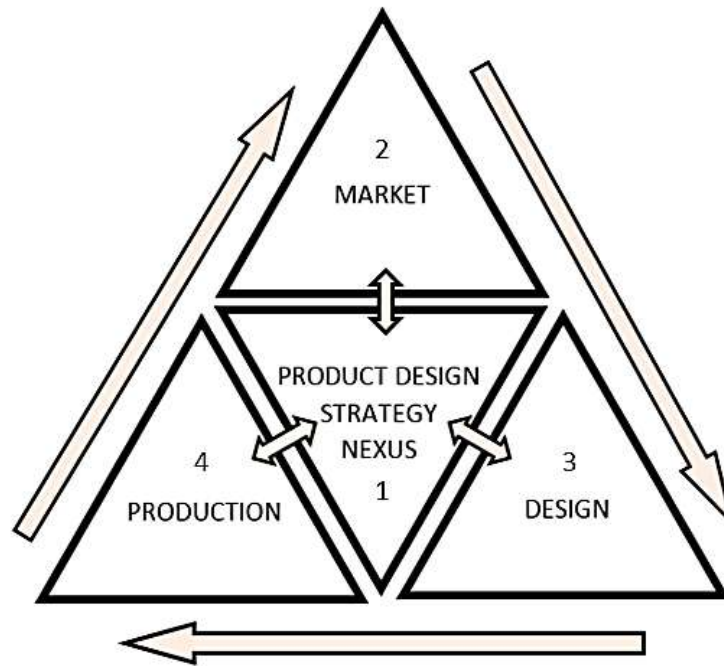


Figure 5.3: Product Design and Development Model.
Source: Author. 2020

1. The Product Design Strategy Nexus (PDSN) is the Design management unit, where the Intrapreneurs (The Internal Information Catalysts) will research and coordinate strategies for TPD. This will include; innovation orientation, knowledge management systems, product design process, market orientation and standards and quality control, all of these used together to secure a product niche in a competitive market. The ‘Product Design Situation and Innovation Strategies’ are processed in the PDSN.

2. Market orientation refers to sensitivity to the market including the Customer and Competitor factors. Strategies will address issues like -Who will use the product? - Why? -Where? -How? –When? With whom to collaborate with in Marketing?

3. Design is sensitive to the elements of design and the creativity process. This is the research lab dealing with creative concepts and innovation in consultation with the PDSN.

4. Production orientation refers to sensitivity to the technical aspects of production. Strategies should answer questions such as - What technique? -Which materials? – What tools/equipment?

5.6.3 The Product Design Strategy Nexus (PDSN)

The PDSN is the control centre of the PDD process. Crucial design management decisions are made here regarding not only the vision and mission of the enterprise, but also ensuring that the PD process is supported within an enabling environment to accomplish set targets. The PDSN can be illustrated as shown in Figure 5.4. The triangle represents the Product Design Strategy Nexus (PDSN); this can be referred to as the ‘internal design and management environment’, where the internal product design factors are considered. The circle represents the Market where the customers, material suppliers and the enterprises interact. The PDSN is found within an enterprise which exists in a market. The market can be referred to as the ‘external design and business environment’, where the external product design factors are considered.

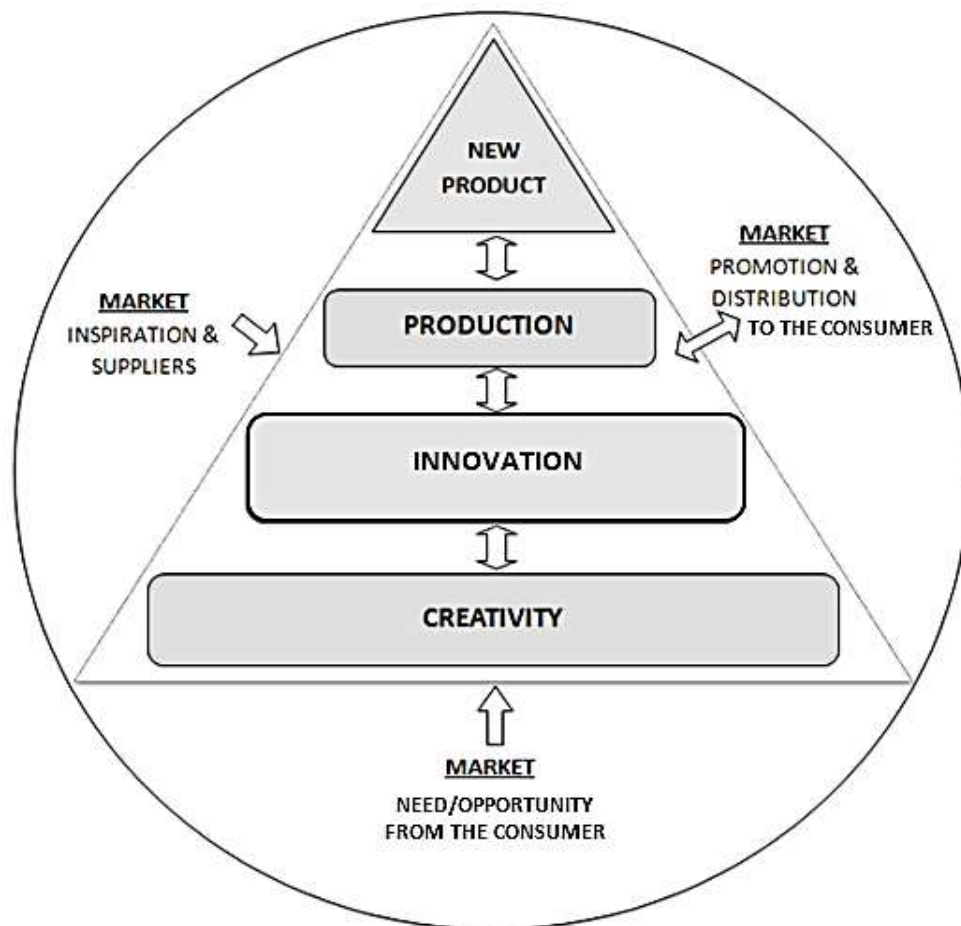


Figure 5.4: The Textile Product Design Strategy Nexus
Source: Author. 2020

5.6.4 Product Design Situation and Innovation Strategies

Since the focus of the whole design process is on innovation, the textile MSEs need to be sensitive to ‘Product Design Situation (What type of new product will be created?) and Innovation Strategies’ (What will be the product value priority?). The design situation and innovation strategy will underpin the Product design and development process pursued by the enterprise.

The four design situations adapted from Vellandi, (2007) are Renovate, Adapt, Evolve, and Discontinue. Renovate design situation refers to existing products receiving minor changes and updates. The innovation strategy suggested for Renovate is called Design

Prominence. This involves a design focus on aesthetics, ergonomics, packaging, presentation, and innovative materials and concepts to deliver consumer value. Adapt design situation refers to existing product modification in response to technological improvements or changes in the marketplace affecting consumer demand or supply considerations. The innovation strategy suggested for Adapt is called Concentrated Application; this strategy involves a design focus on a product tailored to the needs and wants of a particular type of customer. Evolve design situation refers to new products creation based on existing technology. The innovation strategy suggested for Evolve is called Desirable Alternative; this strategy involves a design focus on the product's features and benefits within the scope of an existing product category or an established leader therein. Discontinue design situation refers to creation of breakthrough products that differentiate themselves. The innovation strategy suggested for Discontinue is called Feature Leadership; this strategy involves the creation of cutting-edge and highly innovative product solutions that are new and ahead of other products in the market

5.6.5 Product Design Process Model

The process of product design is a varied and intricate endeavour that involves careful planning, creativity, and meticulous attention to detail. The model illustrated in Figure 5.5 shows a step to step product design process that offers a systematic framework that designers can follow, for the efficient and effective execution of each stage of the process. The implementation of a systematic design process facilitates the enhancement of collaboration and communication within a team. Through a methodical approach, designers are able to meticulously examine each stage, enabling them to detect and rectify any potential concerns or enhancements, so yielding a product that is more polished and user-centric.

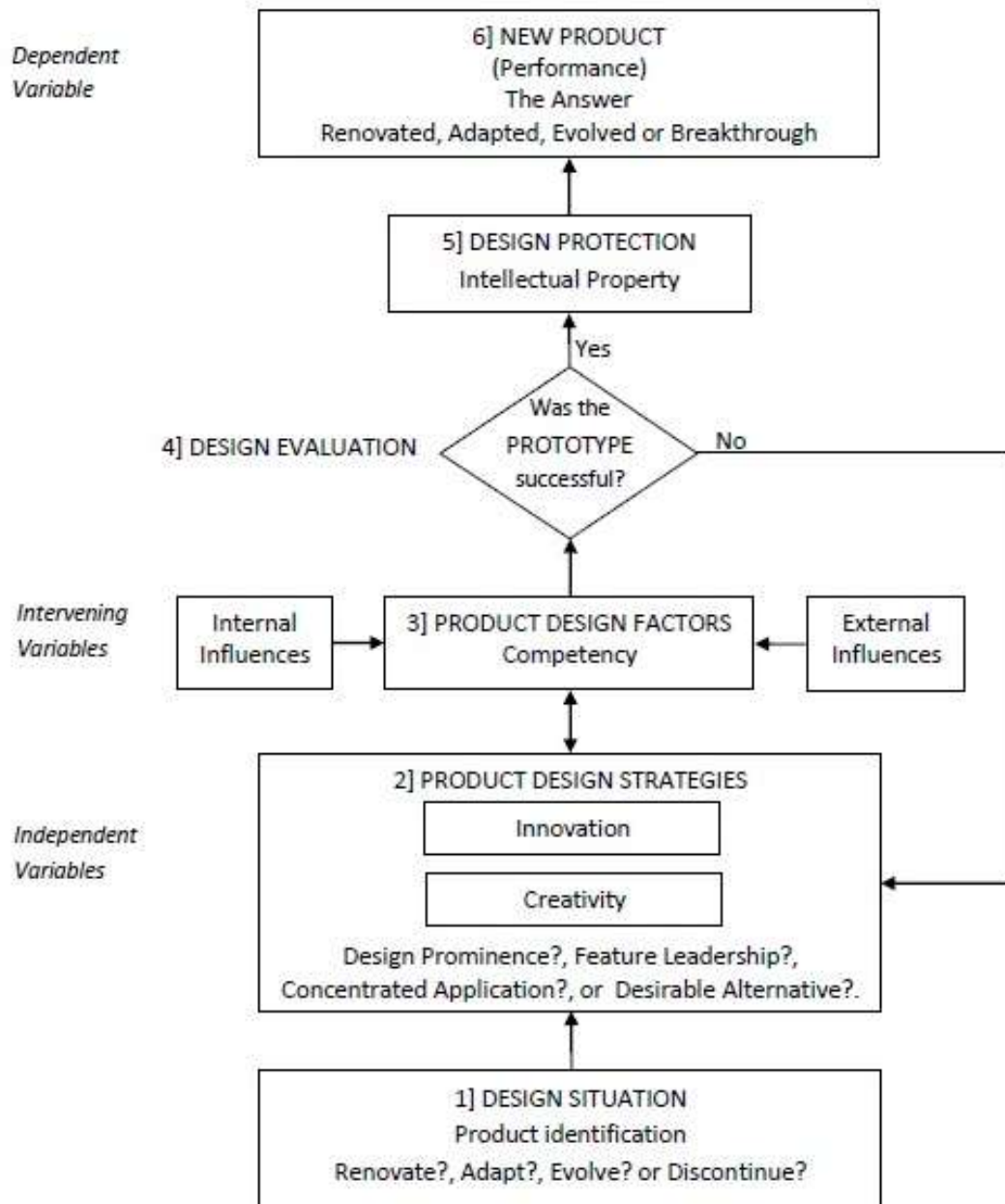


Figure 5.5: Product Design Process Model
Source: Author. 2020

5.6.6 Internal and External Environment Factors of PDD

The PDD model indicates that there is a strong relation between; the design processes the PDSN, the Production unit and the market. The process of PD, production and innovation will therefore carefully consider the internal and external environmental

enablers to accomplish a given design task and target. An interesting way of presenting these factors is to have the acronym “PRODUCTS” to represent the eight (8) PDD work environment constructs.

i) **People**

Be sensitive to both the internal and external human factors/resources. Your internal human factor includes your team members, know the capacity and skills they have. The external human factor includes the customers, who belong to different age groups, different cultures, have different incomes and lifestyles. All these different aspects affect people’s taste and influence what they buy.

Guiding PD Questions:

- What is your human resource capacity?
- Do you have skilled staff to do specific assignments?
- What is the intended market?
- Who are your customers? N/B The characteristics and trends of the target population.

ii) **Resources**

Material properties will determine the suitability of the product. The function, appearance, safety, reliability, durability and overall quality of a product are all affected by the materials used.

Guiding PD Questions:

- What materials are suitable for the design?
- Who will supply the material?

- Are materials accessible and affordable?

iii) **Opposition**

These are your competitors. Products have to compete against a range of alternatives in the same market slot. Advertising and price will affect products competitiveness

Guiding PD Questions:

- Are there similar designs in the market?
Who are your competitors?
- What type of products are your competitors making?
What are your competitors' strength and weakness?

iv) **Design**

A well designed product should successfully do the job for which it was designed. It should meet the needs of the user.

Guiding PD Questions:

- What part does appearance play in the design's function?
- What are the visual and tactile qualities of the product?
- What ergonomic factors need to be considered for visual appeal? Dimension considerations will rely on the use/Function of the product

v) **Use**

Products must be designed to the highest possible standards and work reliably, safely, efficiently and ensure fitness for purpose.

Guiding PD Questions:

- What is the function of the design?
- What must it do?
- Who could use it?
- Why should it be used?
- Where should it be used?
- When should it be used?
- How should it be used?
- What ergonomic factors need to be considered for product use? Dimension considerations will rely on the function of the product

vi) **Construction**

Products should be designed considering not only materials but also construction. The terms creation, fabrication, production, manufacture, assembly and product design implementation will be taken to be synonymous with construction.

Guiding PD Questions:

- What construction methods are appropriate for the design?
- What will be the cost of the PDD process?
- Have you made consideration of resources needed such as human resources, Technology, premises/ infrastructure and time?

vii) **Technology**

The type of technology incorporated will depend upon the functions of the product. Scan for new and appropriate technology that will make the work easier, reduce the work time and in the long run reduce costs.

Guiding PD Questions:

- Does the manufacture require any special technology?
- Are the old technologies still viable?
- Are there modern and appropriate techniques to use?

viii) **Society**

The manufacture, use and final disposal should minimise the chances of harm to people, wildlife and the environment. PDD should be carried out in a legal and ethical way. The process should be ethical and abide with all the statutory regulations of Industry and country.

Guiding PD Questions:

- What are the likely social and environmental effects of the design?
- Is the enterprise working ethically?

5.6.7 Implementation of the Proposed Product Design Strategy Guide

The proposed guide will need to be put through a trial process to ensure effective implementation. After the trial it will be realign to create a training manual for Textile MSE product designers. The researcher envisions that the training of product designers will be incorporated in current and future MSE workshops facilitated by the government and non-government organizations.

The implementation of the product design strategy guide will be in phases; Review of the manual preparation, Training, then Monitoring and Evaluation. These are explained below:

Phase One: Review of the Preparation Training Manual

Step 1: Gaining a better knowledge of the target participant. What will entice trainees to take part? What is their level of knowledge? What is the distinguishing feature of their business? What is the appropriate length of training for them? What are the linguistic and cultural implications? What are the social and economic implications?

Step 2: Review the organisation of the content. Verify the guide's structure; this will be a review of the navigation, or journey route, to be taken in the training to ensure it is ordered logically.

Step 3: Content presentation format. What is the best medium for delivering training content? (Video tutorials, PowerPoint presentations, or written hand-outs)

Step 4 Design and develop the training content. Develop lesson plans, expected lesson outcomes, and assignments. In the case of videos, this includes storyboarding, scripting, recording, and editing.

Phase Two: Training

Step 5: Make a logistics plan for delivery. The number of participants, equipment, or supplies required should be considered also identification of the training venue. The plan includes roles and duties for training partners, activities, a timeline, a budget, and management concerns.

Phase Three: Monitoring and Evaluation

Step 7 Monitoring and Evaluation. Visit the participants at their enterprise to monitor and evaluate implementation of knowledge and skills learnt during the training.

Step 8 Reporting.

5.7 Policy Matters

The Kenyan government has introduced measures to deal with MSE challenges in the past, which includes the establishment of institutions that provide financial assistance,

incubation, and business development services. Notably, the Kenya Industrial Estate (KIE) was established to provide MSEs in the country with financial, incubation, and business development services (Gitau & Wanyoike, 2014). Gitau and Wanyoike (2014) discovered that incubation services like networking, new product development, and enhancing innovation had a strong correlation with the growth of MSEs. However, many enterprises continue to experience challenges and need focused government mitigation assistance. More recently in 2021 the Government of Kenya launched a policy to promote Micro and Small Enterprises (MSEs) for wealth and employment creation (Micro & Small Enterprises Authority, 2021). Other recent initiatives include the National Talent Training Programme (NTTP) administered by the Ministry of Education's Department of Post-Training and Skills Development (PTSD). The programme's purpose is to provide young talented persons with the tools they need to turn their abilities into self-employed entrepreneurial products or services. Another recent initiative in 2022 is the establishment of the Creative Economy Taskforce by the Kenya Ministry of Sports, Culture and Heritage. The mandate is to guide and develop strategies to boost the creative enterprises' economic contributions and create an enabling environment for them (GOK 2022).

Improved MSE competitiveness could obviously contribute to socio-economic development and poverty reduction. While the contributions of the Kenyan government towards small and micro businesses' development are generally acknowledged, small and micro businesses face many obstacles that limit their long-term survival and development. The Government continues to abide by various World, Africa and country policies/guidelines set to nurture and develop innovations in the MSEs and country. These policy guidelines includes the SDGs, Africa's Agenda 2063, Kenya Vision 2030,

MSE Act 2012 together with the Big Four Agenda, Science, Technology and Innovation (STI) policy, The Kenya National Industrialization Policy, Intellectual Property, and Designers' Association guidelines.

CHAPTER SIX: SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

6.1 Introduction

The chapter presents the summary, conclusions and recommendations sections. The summary states the major findings and their implications in Textile design. The conclusion section draws persuasive inferences arising from the study. The recommendations section also includes suggestions of areas for further research.

6.2 Summary

Kenyan textile micro and small enterprises (MSEs) face a myriad of performance challenges, key being low product differentiation. This is when enterprises imitate each other's products. Scholars have recommended research into the most effective business strategies textile micro-enterprises can utilize in order to address low product differentiation.

Though few studies have examined how product design methods for innovation affect textile micro and midsize companies (MSEs), the purpose of this study was therefore to determine the utilization of product design strategies on the performance of textile MSEs in Nairobi and thereafter develop a textile MSE product design guide that will be used in improving product innovations. The first objective of the research explained the product design strategies used by MSEs in the textile sub-sector. The second objective sought to determine the number of product innovations generated by textile MSEs in the combined year's 2016 and 2017. The third objective of the study sought establish the influences of product design strategies on the performance of the textile

while the the fourth objective was to develop and propose a product design guide for textile MSEs to enhance their innovations.

The study, which utilised a deductive methodology and adopted an epistemological perspective, was consistent with the principles of pragmatic philosophy. The study employed a survey methodology with a descriptive and explanatory research design, utilising quantitative analysis for data analysis. It focused on the central business district (CBD) in Nairobi City County, Kenya. The study utilised purposive and snowball sampling methods to discover textile micro and small enterprises (MSEs) within an infinite population. The utilisation of purposive and snowball sampling approaches was necessary in identifying micro and small enterprises (MSEs) for the study due to the absence of a comprehensive enterprise record (sample frame). The distribution of questionnaires to selected company managers and employees was conducted using a face-to-face/in-person delivery method.

The findings to the question of strategies used indicated that benchmarking was most commonly used, followed by Originality and Technology strategy. Following a ranking of the firms' preferred top strategies in the categories of 1st, 2nd, and 3rd choice strategy, the textile MSEs' top preferred strategies were found to be Benchmarking, Research, and Technology. The nonparametric legacy dialogue chi-square 'Goodness of fit' test was used to assess the variations in strategy utilisation among textile MSEs. The results revealed that the utilisation of some strategies, namely Association, Collaboration, and Diversification strategies, had a large variance, resulting in a higher chi-square test statistic. Also, the observed frequency data showed that many textile MSEs reported not using these three strategies as compared with the other four

(Benchmarking, Originality, Research, and New Technology). The study found that the utilisation of product design strategies varied significantly among the textile MSEs in Nairobi City County, so the null hypothesis H_{01} There is no significant variation in the type of product design strategies used by the textile MSEs in Nairobi City County; therefore, it was rejected.

Findings to the question to determine the number of product innovations generated by textile MSEs in the combined year's 2016 and 2017, found the performance to be just above average with most enterprises creating between 10 and more product. The apparel category accounted for most of the product innovations. The chi-square goodness of fit test was statistically significant ($\chi^2 (4) = 106.755, p < .001$), for the variation in the amount of product innovations by textile MSEs. The null hypothesis H_{02} *There is no significant variation in the number of product innovations among textile MSEs* was rejected.

A multiple logistic regression test was used to inquire into the influence of product design strategies on the performance of textile MSEs. The test results indicated that both benchmarking strategies and research strategies have a significant influence on innovation. In order to examine the association between benchmarking and performance a Pearson chi-square independence test was employed. The results of this test revealed a statistically significant chi-square value $\chi^2 (1, N = 143) = 12.584, p < .001$, for the benchmarking strategy data. The analysis of the research strategy data revealed a statistically significant chi-square value of $\chi^2 (1, N = 143) = 17.320, p < .001$. However, the results of the Lambda test indicated a weak association between the use of benchmarking strategy and the level of product innovation. Additionally, the

association between research strategy and product innovation was shown to be moderate. The ANOVA analysis revealed that the combined strategies had medium to small effects on the dependent variable, as indicated by the Partial Eta Squared (η^2) values. The findings indicated that the combination of benchmarking and diversification yielded a moderate effect size of 13.2%. Similarly, the combination of originality and diversification resulted in a moderate effect size of 7.7%. On the other hand, the combination of benchmarking and collaboration had a small effect size of 3.5%, while collaboration in conjunction with technology had a small effect size of 2.8%. Therefore, it can be concluded that there is a significant influence of product design strategies on the performance of textile MSEs in Nairobi City County, Kenya. The null hypothesis *H03 There is no significant influence of product design strategies on the performance of textile MSEs in Nairobi City County, Kenya* was rejected.

Benchmarking was an independent variable whose significance was noted in tests to see which strategy was (1) the most popular, (2) the most important to performance after research, and (3) strongly linked to performance. This was an interesting observation. This study also identified the design management component as a key intervening variable that determines the performance of textile MSEs. Most of the challenges reported by the MSEs are anchored in design management responsibilities.

The primary aim of the fourth objective was to formulate and present a comprehensive product design guide specifically tailored for textile micro and small enterprises (MSEs) with the intention of augmenting their capacity for innovation. The purpose of this guide is to provide a comprehensive overview of the process that an organisation might undertake in order to design and develop distinctive textile products. The

"Product Design and Development (PDD) Model" and the "Product Design Process Model" are the two primary parts of the Product Design Guide. The PDD model's internal and external environmental enablers that are required to complete a particular product design task are taken into account. It is envisioned that the PDD guide will be developed into a product design training manual for the Textile MSEs.

6.3 Conclusion

Textile MSEs in Kenya have been reported to experience product design challenges, key of these being low product differentiation and few innovations (diversifications). Kinuthia et al. (2011) noted a shortage (gap) of knowledge on how to assist textile microenterprises solve these challenges. They recommended that more research be done into the most effective strategies to use in textile microenterprises for business performance. Gudda et al. (2013) also called attention to this knowledge gap, citing a lack of continuous improvement and enhancement of MSE product innovativeness as a concern. Product design is a key component of an enterprise's performance, because it pertains to creativity and product innovation. The above gap implied that one of the studies could investigate the relationship between design strategies, product innovation, and the business performance of textile MSEs. The purpose of this research was therefore to establish the product design strategies used and their influence on the performance of MSEs in the textile sub-sector of Nairobi City County.

Enterprise product design strategies were selected from seven strategy types. The study found that MSEs adopted different product design techniques. Also, textile MSEs had statistically significant differences in new product innovations. The study found that overreliance on benchmarking and external orientation research leads to the challenge

of product imitation or copying. As indicated in this study, small enterprises which lack the human and financial resources to conduct extensive R&D programmes, mainly rely on customers for product ideas, resulting to copying and imitation. There is a need to promote the use of combined product design strategies to develop textile product innovations. This recommendation is based on the findings of an ANOVA effect size study, which indicated that the combined strategies yielded favourable "effect size" values.

In addition to the primary results that address the research inquiries, the investigation unveiled other secondary and relevant findings. The main constraints identified limited skills in creativity and design. The study also reported suggested solutions by the textile MSEs to their product design challenges. A rare revelation from the study was the textile MSE managers' and employees' opinions on their product design work environment attributes. Despite the good ratings by the managers on their preferred design management strategies, the employees' opinions on the work environment and intrapreneurship orientation were on the contrary. According to the research findings, one potential solution to the textile MSEs' product design constraints should be a focus on improving design management practices.

The findings of this study indicate that textile MSEs have the potential to enhance their product design performance targets by optimising the utilisation of the seven strategy categories. The research project has yielded a "Proposed Product Design Strategy Guide for Textile Micro and Small Enterprises (MSEs)" aimed at providing potential benefits to MSEs operating within the textile sub-sector. Prior studies on textile design have mainly concentrated on large and medium-sized businesses, particularly in developed

countries. This study adds to the scant body of knowledge on product innovation and design studies in textile MSEs in Kenya. This research is one of the few done within the domain of product design strategies for textile MSEs in Nairobi City County, Kenya.

This theoretical thesis enhances scholarly understanding by examining the various components of creativity, innovation, and product design process in the context of the CToC, CK, DCT, and RBV theories. The suggested new interpretations make a valuable contribution to the current body of knowledge within the realm of textile product design. Successful textile product innovation necessitates an intrapreneural orientation, which is dependent upon a creative, innovative, and business mind-set, within a work environment characterised by effective design management practice.

6.4 Recommendations

On the basis of this study, the following recommendations are made. That:

1. Textile MSEs should strive for a robust design process that will ensure the creation of viable and quality products for the market. The various product design strategies feasible for an enterprise need to be optimised and used in combination with other strategies for enhanced performance (innovation).
2. Textile MSEs in the country should pay more attention to product design and development. The more an enterprise uses a strategic product design approach, the better its chances of introducing successful products. This study has proposed an elaborate product design and development guide.

3. Textile MSEs should improve on the use of the following strategies that received low scores; Support from associates and corporates (Association) 16/153 (10.5%), Collaboration with partner enterprises 34/153 (22.2%) and, Creation of new and different products (Diversification) 58/153 (37.9%). These three strategies should be prioritized; however, due to their limiting size characteristic; the MSEs need to use association and collaboration to improve performance, while diversification strategy can be effectively employed to mitigate competition and imitations.

4. Where the textile MSEs are limited by resources to carry out robust R&D and NPD, association and collaboration with design consultative units in Research institutions, Universities, government departments or NGOs should be encouraged. Generally, more organizations should collaborate with textile MSEs to alleviate their constraints. There are a few of such programmes like the Kenya Youth Employment and Opportunities Project (KYEOP) sponsored by the Government of Kenya, the Transcultural Perspective in Arts and Art Education (TPAAE) sponsored by the European Union, and Creative DNA sponsored by the British Council.

5. Where the textile MSEs have limited time to carry out robust R&D and NPD, they should collaborate with institutions like universities which are better placed to experiment using guides like the C-K design theory. They are also better placed to engage in R&D and experiments on Design spillovers.

6. All approaches by Government and NGOs to make the MSEs competitive should be embraced. Support to textile MSEs should not only focus on financial

management and marketing, but also other manufacturing aspects including product design and development facilitation.

7. Government should support and enhance education and training programmes for textile MSEs, particularly in the areas of product design and development.

6.5 Areas for Further Research

Arising from the findings of this study, further studies can be carried out in the following product design areas:

1. Research on the effects of the various intervening variables in this study on the success and sustainability of the textile MSE innovations.
2. Research on how the suggested solutions given by the textile MSEs can be individually studied to further develop NPD training material/manuals.
3. Research on product design strategies influencing Textile MSE performance in the post-corona period to determine whether the findings of this study still hold.
4. Research on the impact of textile MSE managers' age on their ability to undertake design management and innovation
5. Research on the impact of textile MSE managers' experience on their ability to undertake design management and innovation
6. Research on the impact of government and non-government institutions' product design programmes on textile MSE performance.

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Appendix B: Nairobi CBD Survey Zones

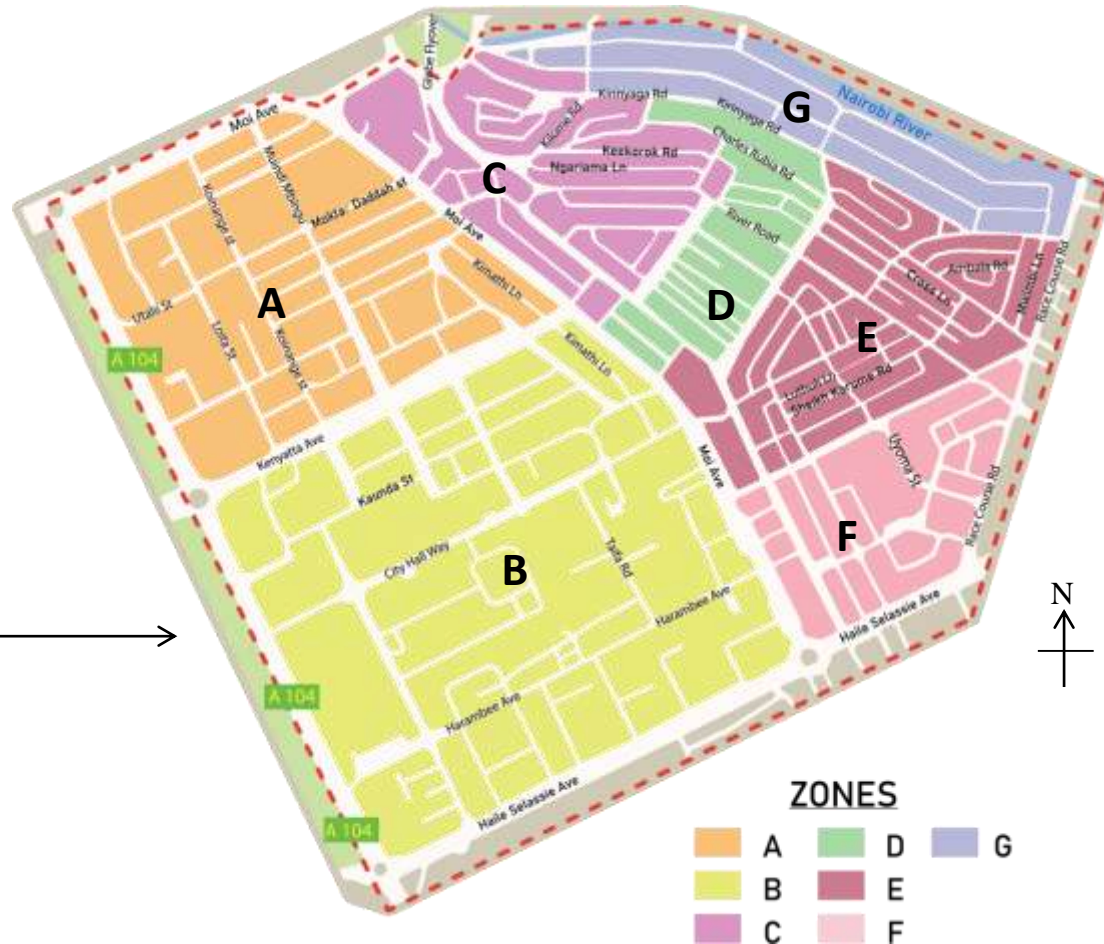
Nairobi City County



Nairobi City CBD



Data Collection Zones



Source: Author (2020)

Nairobi CBD Survey Zones and Number of Response

Zone	Area And Boundary	Sample	Responding Mses
A	Area between Uhuru Highway to Moi Avenue and Waiyaki Way to Kenyatta Avenue	20	20
B	Area between Uhuru Highway to Moi Avenue and Kenyatta Ave to Haile Selassie Ave	15	14
C	Area between Moi Avenue to Kirinyaga Road and Slip way to Latema Road	55	51
D	Area between Moi Avenue to Kirinyaga Road and Latema Road to Accra Road	40	25
E	Area between Moi Avenue to Kirinyaga Road and Accra Road to Ronald Ngala Street	30	26
F	Area between Moi Avenue to Race Course Road and Ronald Ngala St to Haile Selassie Ave	20	14
G	Area between Kirinyaga Road to Nairobi River and Globe roundabout junction to Race Course Road	10	3
			153

Source: Author (2020)

Appendix C: Questionnaire for Managers

Dear Sir/Madam

This questionnaire aims at gathering information on the product design strategies textile MSEs employ to have a competitive advantage in the market. All information obtained through this process will be used for research purposes only and handled in strict confidence.

Kindly therefore answer all questions as candidly as possible using a (✓) or by giving your opinion where applicable. When ticking plus ordering, then 1 is the most prioritized and 3 is the least prioritized.

A1. ENTERPRISE PROFILE:

1.	Enterprise Name:						
2.	Sub - County			Ward:			
3.	Number of	2017					
4.	Workers in:	2016					
5.	Age of Enterprise:		10 or less	11–20	21–30	31–40	41+

A2. RESPONDENT PROFILE:

6.	Highest Education level?	Primary	Secondary
		Diploma (A-level/College),	University Bachelor
		University Master	University Doctor

B1. PRODUCT DESIGN STRATEGIES

7.	Which are your top three Product Design and Development strategies?	Tick and order Insert 1,2 or 3
a)	Comparison with high performers in the same trade	
b)	Support from associates and corporates	
c)	Collaboration with partners enterprises	
d)	Creation of original products	
e)	Research Activities	
f)	Creation of new and different products (Diversification)	
g)	New technology for product design/creation	

8.	Which of these do you include in your design management process?	Tick and order 1 to 6
a)	I sometimes delegate authority	
b)	I use a formal operation plan	
c)	I encourage internal communication	
d)	I recognise good performance	
e)	I build staff morale	
f)	I foster teamwork spirit	
<i>Tick all that apply</i>		

9.	Who decides on Designs?	<input type="checkbox"/> Owner	<input type="checkbox"/> Supervisor	<input type="checkbox"/> Designer	<input type="checkbox"/> Artisan	<input type="checkbox"/> Customer
10.	How are designs originated?	Competitors	<input type="checkbox"/> Customers	<input type="checkbox"/> Books	<input type="checkbox"/> Internal concepts	

11. Are employees and you encouraged to: <i>Tick all that apply</i>		Managers	Employees
a)	Acquire product design knowledge?		
b)	Share design knowledge within the enterprise?		
c)	Keep design skills up to date?		
d)	Source for designs from outside?		

12. As a manager, do you consider it important in design to?		Yes	No
a)	Access external expertise?		
b)	Acquire skilled personnel?		
c)	Improve in-house skills?		
d)	Employ foreign experts?		
e)	Offer design training after employment?		

13. Your enterprise's customer orientation is:		Never	Rarely	Sometimes	Usually	Always
a)	To use customer information to improve quality of product?					
b)	To have adequate information about customers?					
c)	To have adequate information about competitors?					

14. Your enterprise's design approach is:		Never	Rarely	Sometimes	Usually	Always
a)	To renovate existing products through minor changes?					
b)	To modify existing products by adapting Technology trends?					
c)	To create new products by adapting existing Technology?					
d)	To create totally new products not similar to any in the market?					

15. Does your design work go through the following process chain?		Yes	No
a)	Consumer Requirement (For own design idea) → Product Feasibility (Research & Development) → Product creation		
b)	Consumer Requirement (customer brings/selects design) → Product creation		
c)	If neither (a) nor (b) then explain your design process chain at the back of this page.		

16. Your enterprises innovation strategy is:		Never	Rarely	Sometimes	Usually	Always
a)	Create products that stand out through presentation and innovative material?					

b)	Product designs are to be new and ahead of other existing products					
c)	Products created to the needs of particular type of customer.					
d)	Create a desirable alternative to existing products					

B2. PRODUCT DESIGN PERFORMANCE

17. Which of these statements about your enterprise's goals is true?		True	False
a)	Design activities are aligned to the enterprises vision and goals?		
b)	Product design targets were accomplished in the last year?		

18.	What end products does your enterprise produce?
19.	How many product innovations were introduced during the past two years?	
	None, 1-3, 4-6, 7-9, 10 and More	

		Yes	No
20.	a) Has your enterprise been affected by Product Imitation?		
	b) If yes, How many in the past two years?		
	1-3, 4-6, 7-9, 10 and More		

21. List three (3) top problems when designing (Creating and innovating) your Textile Products?

- a)
- b)
- c)

22. List any other problem when designing (Creating and innovating) your Textile Products?

- a)
- b)
- c)

23. List three (3) possible solutions for problems stated above?

- a)
- b)
- c)

24. List any other possible solution for your textile product design problem?

- a)
- b)
- c)

B3. PRODUCT DESIGN INFLUENCE ON ENTERPRISE PERFORMANCE

25. How is your enterprise's growth performance (Productivity)?

(Number of New products/ Innovations)		Low (Poor)	Neutral	High (Good)
a)	Year 2017			
b)	Year 2016			
c)	Year 2015			

Product Design Rating.

How do you rate your enterprise in the following?		1 <i>Very Poor</i>	2 <i>Poor</i>	3 <i>Fair</i>	4 <i>Good</i>	5 <i>Excellent</i>
a)	Product quality in meeting customer needs					
b)	Product design funding					
c)	Capability to develop products more effectively and economically?					
d)	Timely Responsiveness to competitive forces?					
e)	Timely Responsiveness to technological development?					
f)	Investment in Product Design and Development?					

27. How do you **compare your company with your main competitors**, on average for the last three years? (*Tick Yes or No*)

		Yes	No
a)	We have more new products		
b)	We usually create products having totally new designs		
c)	There exists a very strong emphasis on the development of new and innovative products		
d)	We are brave to do high risk design projects		
e)	Bold, wide ranging acts are necessary to achieve the firm's objectives.		
f)	We adopt a bold aggressive posture in order to maximise the probability of exploiting potential opportunities.		
g)	Typically we initiate actions to which competitors then respond.		
h)	We are very often the first business to introduce new products.		
i)	We typically adopt a very competitive, 'undo-the competitors' posture.		

		Yes	No
C1. INNOVATION ORIENTATION CHECKLIST'			
1.	Innovative new products help your enterprise's future success?		
2.	You control the future success of innovation for your enterprise?		
3.	New products innovations have more value than old products?		
4.	Internal innovation will yield greater returns than copying the competitors design?		
5.	Long-term investments in innovation will yield profits?		
6.	A balance of new products portfolio will yield profits?		
7.	Product innovation quantity and quality are equally important?		
8.	Will new answers to current challenges result in new product opportunities?		
9.	You are the biggest asset for innovation in your enterprise?		
10.	Can an effective innovation mind-set inspire staff to perform better?		
11.	You believe that the success or failure of innovation is entirely dependent on your actions?		
12.	Keeping score on innovation is important?		
13.	Accept that failure is an inherent component of innovation?		
14.	Maintaining a proactive, optimistic, and positive approach to innovation is critical for safeguarding morale?		
15.	One of your top five priorities should be innovation?		

D1. ENTERPRISE CONTACTS: Optional

<i>For follow up on research, and future leads on product design opportunities</i>	
Telephone:	
Email:	

THANK YOU

Appendix D: Questionnaire for Employees

Dear Sir/Madam

This questionnaire aims at gathering information on the Product Design process from employees in textile MSEs. All information obtained through this process will be used for research purposes only and handled in strict confidence.

Kindly answer all questions truthfully using a (✓) or by giving your opinion where applicable.

A1. RESPONDENT PROFILE

1.	Highest Education level?	Primary			Secondary	
		Diploma (A-level/College),			University Bachelor	
		University Master			University Doctor	
2.	Position in enterprise /Job Title					
3.	How many years have you worked in the enterprise? :	3 or less	4–7	8–11	12–15	16 +

B1. PRODUCT DESIGN AND DEVELOPMENT ENVIRONMENT

4.	How do you rate your enterprise's Design focus in the following:	<i>1 Very Poor</i>	<i>2 Poor</i>	<i>3 Fair</i>	<i>4 Good</i>	<i>5 Excellent</i>
a)	Internal communication process?					
b)	Recognition for good performance?					
c)	Creating teamwork spirit?					
d)	Freedom to initiate new products					
e)	Time allowance for research					
f)	Encouragement of controlled risks					
g)	Tolerance to design failures					
h)	Encouragement to learn and keep knowledge					
i)	Encouragement for design skill upgrading?					
j)	Keeping up with new technology					

C1. ARTISAN/DESIGNER'S ORIENTATION

5.	Which of these statements do you agree with?	True	False
a)	You are aware of the company's Product Design and Development Strategies?		
b)	You work following a laid out design and production framework?		
c)	You always have adequate information about customers?		
d)	You use customer information to develop new products?		
e)	You always have adequate information about competitors?		
f)	Your designs do not imitate other products in the market?		

6. List three (3) top problems when designing (Creating and innovating) your Textile Products?

- a)
- b)
- c)

7. List any other problem when designing (Creating and innovating) your Textile Products?

- a)
- b)
- c)

8. List three (3) possible solutions for problems stated, in answer 7 above?

- a)
- b)
- c)

9. List any other possible solution for your textile product design problem?

- a)
- b)
- c)

..... **THANK YOU**

Appendix E: Reliability Tests Results

1) Pilot Survey Reliability Test Results for Managers' Questionnaire

KUDER-RICHARDSON (KR-20) TEST

Q. 28. How do you compare your company with your main competitors, on average for the last three years? (*Tick Yes or No*)

		Yes	No
a)	We have more new products		
b)	Changes in our products have usually been radical. (Totally New)		
c)	There exists a very strong emphasis on the development of new and innovative products		
d)	There is a strong liking for high risk projects (with chances of very high return).		
e)	Bold, wide ranging acts are necessary to achieve the firm's objectives.		
f)	Typically we adopt a bold aggressive posture in order to maximise the probability of exploiting potential opportunities.		
g)	Typically we initiate actions to which competitors then respond.		
h)	We are very often the first business to introduce new products.		
i)	We typically adopt a very competitive, 'undo-the competitors' posture.		

Kuder-Richardson (KR-20) Test

```

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NEW FILE.
DATASET NAME DataSet5 WINDOW=FRONT.
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DATASET CLOSE DataSet5.
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/STATISTICS=DESCRIPTIVE SCALE CORR
/SUMMARY=TOTAL.

```

➔ Reliability

[DataSet6]

Warnings

Each of the following component variables has zero variance and is removed from the scale: Comparison with Competitor_Sacrifice for Innovation, Comparison with Competitor_Bold and Aggressive

Scale: ALL VARIABLES

Case Processing Summary

		N	%
Cases	Valid	14	100.0
	Excluded ^a	0	.0
	Total	14	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.735	.753	7

Item Statistics

	Mean	Std. Deviation	N
Comparison with Competitor_ More new products	.86	.363	14
Comparison with Competitor_ Usually Radical Innovation	.50	.519	14
Comparison with Competitor_ Stronger emphasis on Innovation	.86	.363	14
Comparison with Competitor_ Liking of High risk projects	.50	.519	14
Comparison with Competitor_ First to Initiate new ideas	.79	.426	14
Comparison with Competitor_ First to Initiate new Products	.50	.519	14
Comparison with Competitor_ Adopt Disruptive Innovation	.79	.426	14

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Comparison with Competitor_ More new products	3.93	3.148	.460	.820	.704
Comparison with Competitor_ Usually Radical Innovation	4.29	2.835	.440	.628	.707
Comparison with Competitor_ Stronger emphasis on Innovation	3.93	2.995	.595	.851	.678
Comparison with Competitor_ Liking of High risk projects	4.29	3.143	.251	.498	.755
Comparison with Competitor_ First to Initiate new ideas	4.00	2.923	.528	.724	.686
Comparison with Competitor_ First to Initiate new Products	4.29	2.835	.440	.663	.707
Comparison with Competitor_ Adopt Disruptive Innovation	4.00	2.923	.528	.729	.686

Scale Statistics

Mean	Variance	Std. Deviation	N of Items
4.79	3.874	1.968	7

2) Pilot Survey Reliability Test Results for Employees' Questionnaire

CRONBACH ALPHA TEST

Please give a rating of 1] Very Poor, 2] Poor, 3] Fair, 4] Good, 5] Excellent, for the following 3 questions (5-7)

5. How do you rate your company's internal communication process? 1 2 3
4 5
6. How do you rate your company's recognition for good performance? 1 2 3
4 5
7. How do you rate your company's effort in creating teamwork spirit? 1 2 3
4 5

Cronbach Alpha Test Results

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➔ Reliability

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Scale: ALL VARIABLES

Case Processing Summary

		N	%
Cases	Valid	17	60.7
	Excluded ^a	11	39.3
	Total	28	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.824	.832	3

Item Statistics

	Mean	Std. Deviation	N
Internal Communication	4.18	.809	17
Recognition	4.24	.664	17
Teamwork	4.18	.809	17

Inter-Item Correlation Matrix

	Internal Communication	Recognition	Teamwork
Internal Communication	1.000	.616	.522
Recognition	.616	1.000	.732
Teamwork	.522	.732	1.000

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Internal Communication	8.41	1.882	.606	.390	.836
Recognition	8.35	1.993	.772	.611	.686
Teamwork	8.41	1.757	.686	.544	.753

Note: Two employees from each of the 14 enterprises participated in the survey.
Thus, 28 respondents

Appendix F: Used PD Strategies Test Results

Chi-square 'Goodness of Fit' Test Results

NPar Tests

[DataSet1] D:\Research Data Analysis\July\AO_Manager Sub_DataSet.sav

Descriptive Statistics

	N	Mean	Std. Deviation	Minimum	Maximum
Benchmarking Strategy	153	1.46	.500	1	2
Association Strategy	153	1.90	.307	1	2
Collaboration Strategy	153	1.78	.417	1	2
Original Strategy	153	1.49	.502	1	2
Research Strategy	153	1.54	.500	1	2
Diversification Strategy	153	1.62	.487	1	2
New Technology Strategy	153	1.50	.502	1	2

Chi-Square Test

Frequencies

Benchmarking Strategy

	Observed N	Expected N	Residual
Yes	83	76.5	6.5
No	70	76.5	-6.5
Total	153		

Association Strategy

	Observed N	Expected N	Residual
Yes	16	76.5	-60.5
No	137	76.5	60.5
Total	153		

Collaboration Strategy

	Observed N	Expected N	Residual
Yes	34	76.5	-42.5
No	119	76.5	42.5
Total	153		

Original Strategy

	Observed N	Expected N	Residual
Yes	78	76.5	1.5
No	75	76.5	-1.5
Total	153		

Research Strategy

	Observed N	Expected N	Residual
Yes	71	76.5	-5.5
No	82	76.5	5.5
Total	153		

Diversification Strategy

	Observed N	Expected N	Residual
Yes	58	76.5	-18.5
No	95	76.5	18.5
Total	153		

New Technology Strategy

	Observed N	Expected N	Residual
Yes	77	76.5	.5
No	76	76.5	-.5
Total	153		

Test Statistics							
	Benchmarking Strategy	Association Strategy	Collaboration Strategy	Original Strategy	Research Strategy	Diversification Strategy	New Technology Strategy
Chi-Square	1.105 ^a	95.693 ^a	47.222 ^a	.059 ^a	.791 ^a	8.948 ^a	.007 ^a
df	1	1	1	1	1	1	1
Asymp. Sig.	.293	<.001	<.001	.808	.374	.003	.936
Monte Carlo Sig	.320 ^b	<.001 ^b	<.001 ^b	.869 ^b	.412 ^b	.007 ^b	1.000 ^b
90% Confidence Interval							
Lower Bound	.258	.000	.000	.824	.346	.000	.985
Upper Bound	.382	.015	.015	.914	.477	.017	1.000

a. 0 cells (0.0%) have expected frequencies less than 5. The minimum expected cell frequency is 76.5.

b. Based on 153 sampled tables with starting seed 1597675572.

Source: Survey data. 2020

Appendix G: Product Innovation Variation Test Results

PD Innovation. Chi-Square Test Frequencies and Statistics

NPar Tests

Descriptive Statistics

	N	Mean	Std. Deviation	Minimum	Maximum
Product Innovations	143	3.86	1.397	1	5

Test Frequencies

Product Innovations

	Observed N	Expected N	Residual
None	10	28.6	-18.6
1-3	23	28.6	-5.6
4-6	21	28.6	-7.6
7-9	12	28.6	-16.6
10 or more	77	28.6	48.4
Total	143		

Test Statistics

		Product Innovations
Chi-Square		106.755 ^a
df		4
Asymp. Sig.		<.001
Monte Carlo S. Sig.		<.001 ^b
90% Confidence Interval	Lower Bound	.000
	Upper Bound	.015

a. 0 cells (.0%) have expected frequencies less than 5. The minimum expected cell frequency is 28.6.

b. Based on 153 sampled tables with starting seed 926214481.

Source: Survey data. 2020

PD Innovation. (Dichotomy), Chi-Square Test Frequencies and Statistics

NPar Tests

Descriptive Statistics

	N	Mean	Std. Deviation	Minimum	Maximum
Innovations	153	.58	.495	0	1

Test Frequencies

Innovations

	Observed N	Expected N	Residual
Not Innovative	64	76.5	-12.5
Innovative	89	76.5	12.5
Total	153		

Test Statistics

		Innovations	
Chi-Square		4.085 ^a	
df		1	
Asymp. Sig.		.043	
Monte Carlo Sig.	Sig.	.052 ^b	
	90% Confidence Interval		
		Lower Bound	.023
		Upper Bound	.082

a. 0 cells (.0%) have expected frequencies less than 5. The minimum expected cell frequency is 76.5.

b. Based on 153 sampled tables with starting seed 299883525.

Appendix H: PD Strategies Influence on Performance

Logistic Regression Results **Logistic Regression**

[DataSet1] D:\Research Data Analysis\July\6_Manager DataSet.sav

1]

Case Processing Summary

Unweighted Cases ^a		N	Percent
Selected Cases	Included in Analysis	153	100.0
	Missing Cases	0	.0
	Total	153	100.0
Unselected Cases		0	.0
Total		153	100.0

a. If weight is in effect, see classification Table for the total number of cases.

2]

Dependent Variable Encoding

Original Value	Internal Value
Not Innovative	0
Innovative	1

3]

Categorical Variables Codings

		Frequency	Parameter coding (1)
New Technology Strategy	Yes	77	.000
	No	76	1.000
Association Strategy	Yes	16	.000
	No	137	1.000
Collaboration Strategy	Yes	34	.000
	No	119	1.000
Original Strategy	Yes	78	.000
	No	75	1.000
Research Strategy	Yes	71	.000
	No	82	1.000
Diversification Strategy	Yes	58	.000
	No	95	1.000
Benchmarking Strategy	Yes	83	1.000
	No	70	.000

Shows the coding of the independent variables and the frequency counts obtained. (N/B

All the Independent variables for this test were Categorical)

Block 0(Zero): Beginning Block

A block of outputs that consists of:

- Classification Table,
- Variables in the Equation,
- Variables not in the Equation.

Block 0(Zero) describes the results when none of the independent/predictor variables were included in the logistic regression analysis. This block of output only serves as a baseline for comparison when the independent/predictor variables are not included and when they are included in the Logistic regression analysis. No predictor was excluded from the analysis in this study, therefore, no need to discuss Block 0(Zero)

4]

Classification Table^{a,b}

				Predicted		Percentage Correct	
				Innovations	Innovations		
Observed		Not Innovative	Innovative				
Step 0	Innovations	Not Innovative	0	64			.0
		Innovative	0	89			100.0
Overall Percentage							58.2

a. Constant is included in the model.

b. The cut value is .500

5]

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 0	Constant	.330	.164	4.048	1	.044	1.391

6]

Variables not in the Equation

			Score	df	Sig.
Step 0	Variables	Benchmarking Strategy(1)	14.863	1	<.001
		Association Strategy(1)	.027	1	.869
		Collaboration Strategy(1)	1.199	1	.273
		Original Strategy(1)	3.102	1	.078
		Research Strategy(1)	20.269	1	<.001
		Diversification Strategy(1)	6.834	1	.009
		New Technology Strategy(1)	.524	1	.469
		Overall Statistics	29.285	7	<.001

Block 1: Method = Enter

7]

Omnibus Tests of Model Coefficients

		Chi-square	df	Sig.
Step 1	Step	31.245	7	<.001
	Block	31.245	7	<.001
	Model	31.245	7	<.001

The Omnibus Test of Model Coefficients was used to generate a Goodness of Fit Chi-square statistic, which indicated whether the model accurately reflected the data. This study's Omnibus test results confirmed an accurate reflection ($\chi^2 (7) = 31.245, p = .000, p < .10$). Therefore, the model is statistically significant and exhibits goodness of fit.

8]

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	176.755 ^a	.185	.249

a. Estimation terminated at iteration number 4 because parameter estimates changed by less than .001.

It is similar to the Coefficient of Determination (R^2) test. The model Table shows results of two tests Cox and Snell's R^2 and Nagelkerke's R^2 . The Cox and Snell's R^2 is calculated by comparing the log likelihood of the model to the log likelihood of a baseline model. However, even with a "perfect" model, its maximum value is less than 1 for categorical outcomes. (IBM, 2021c). Nagelkerke's R^2 is a modified version of the Cox & Snell R^2 that modifies the statistic's scale to encompass the entire range from 0 to 1. (IBM, 2021c)

To determine the variance in the independence variables the Nagelkerke's (R^2) model, is preferred it is an adjusted version of the Cox & Snell (R^2) that adjusts the scale of the statistic to cover the full range from 0 to 1. The results of this study show that; Cox & Snell (R^2) = $0.185 * 100 = 18.5\%$ and that Nagelkerke's (R^2), = $0.249 * 100 = 24.9\%$. It can be interpreted as the percentage or proportion of variance outlined in the model. The variance explained by the model ranges from 18.5% (0.185) to 24.9 %.(0.249) in this case we can say that 24.9% change in the criterion variable can be accounted to the predictor variables in the model.

The researcher posits the following criteria to interpret the resulting R^2 value based on the relationship between the predictors and the outcome:

0.2 or less signals a weak relationship, 0.2 to 0.5 signals a moderate relationship, 0.5 or higher signals a strong relationship. The Nagelkerke's (R^2), = 0.249 was the final result, indicating a moderate relationship between the textile MSE design strategies and the performance.

Nagelkerke R2 Formula

The model was developed by Professor Nicolaas Nagelkerke, the formula follows a generalisation that was proposed by D. R. Cox and E. J. Snell, also that of Professor Lonnie Magee. The formula is presented in two versions by Nagelkerke (1991):

$$-\log(1 - R^2) = \frac{2}{n} \{l(\hat{\beta}) - l(0)\}$$

OR

$$R^2 = 1 - \exp \left[-\frac{2}{n} \{l(\hat{\beta}) - l(0)\} \right] = 1 - \{L(0)/L(\hat{\beta})\}^{2/n},$$

Where:

- R^2 is the coefficient of determination, also called the multiple correlation coefficient,
- $\hat{\beta}$ represents the population parameter estimations
- $l(\hat{\beta}) = \log L(\hat{\beta})$ and $l(0) = \log L(0)$

The equations denote the log likelihoods of the fitted and the 'null' model respectively.

9]

Hosmer and Lemeshow Test			
Step	Chi-square	df	Sig.
1	2.390	8	.967

The Hosmer and Lemeshow test is also a test of Model fit. If the significance value is less than .10, the Hosmer-Lemeshow statistic indicates a poor fit. It determines whether or not the model accurately represents the data. The findings were ($\chi^2(8) = 2.390, p = .967, p > .10$), and it therefore has a good match because the p-value is more than .10.

10]

Contingency Table for Hosmer and Lemeshow Test

		Innovations = Not Innovative		Innovations = Innovative		Total
		Observed	Expected	Observed	Expected	
Step 1	1	7	7.030	2	1.970	9
	2	11	10.765	4	4.235	15
	3	9	9.161	5	4.839	14
	4	9	9.317	7	6.683	16
	5	8	6.868	7	8.132	15
	6	6	6.457	10	9.543	16
	7	6	5.404	10	10.596	16
	8	3	3.570	12	11.430	15
	9	2	1.004	4	4.996	6
	10	3	4.425	28	26.575	31

The contingency table for the Hosmer and Lemeshow Test presents the observed and expected values. When the Hosmer and Lemeshow Test p-value is $>.10$ then the observed and expected values will be close to each other. The test results showed a closeness between the observed and expected values; therefore, the model adequately fits the data.

11]

Classification Table^a

	Observed	Predicted		Percentage Correct
		Innovations Not Innovative	Innovations Innovative	
Step 1	Innovations	36	28	56.3
	Not Innovative	18	71	79.8
	Innovative			
	Overall Percentage			69.9

a. The cut value is .500

The classification table indicates if the model or circumstance improves when the predictor variables are included in the analysis. It is a measure of how successfully

the model is able to predict the right category of the dependent output when the independent variables are included in the logistic regression analysis model. The results show 69.9% accuracy in classification or degree of assurance (also known as the "Percentage Accuracy in Classification", PAC). The findings reveal that the model predicted a 69.9 PAC.

The table includes two essential features that serve to ensure the model's output. These are Specificity and Sensitivity. The percentage of cases where the model properly predicted but did not choose the target category in the dependent variable is referred to as specificity. The classification table reveals that individuals who did not respond yes but did say no (not innovative) had a specificity of 56.3%. This accounted for 36 respondents. Sensitivity, on the other hand, refers to the percentage of cases in which the model accurately predicted and chose the target category in the dependent variable. The classification table shows a sensitivity of 79.8% predicted by the model who said yes (were innovative); this was accounted for by 71 respondents. Overall, the model has strong specificity and sensitivity, with the model's accuracy of 69.9% (70%), with 79.8% (80%) correctly predicted to be innovative.

12]

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)	90% C.I. for EXP(B)	
								Lower	Upper
Step 1 ^a	Benchmarking Strategy(1)	.997	.373	7.142	1	.008	2.710	1.467	5.007
	Association Strategy(1)	-.285	.641	.197	1	.657	.752	.262	2.160
	Collaboration Strategy(1)	.578	.472	1.496	1	.221	1.782	.819	3.875
	Original Strategy(1)	.104	.404	.067	1	.796	1.110	.571	2.155
	Research Strategy(1)	-1.291	.407	10.067	1	.002	.275	.141	.537
	Diversification Strategy(1)	.307	.401	.587	1	.443	1.360	.703	2.629
	New Technology Strategy(1)	.119	.386	.095	1	.758	1.127	.597	2.127
	Constant	.065	.835	.006	1	.938	1.068		

a. Variable(s) entered on step 1: Benchmarking Strategy, Association Strategy, Collaboration Strategy, Original Strategy, Research Strategy, Diversification Strategy, and New Technology Strategy.

The variables in the multiple logistic regression equation results table provide useful information for analysing the link between predictor factors and outcome variables. The relationship between the predictor variable and the outcome variable's log odds is shown by the estimated coefficient, which also shows its strength and direction. A positive coefficient implies that increasing the predictor variable leads to a rise in the outcome's log-odds, whereas a negative coefficient indicates the opposite.

The standard error indicates the estimated coefficient's variability. The results of this study show that all cases have small standard errors (all less than 1), implying more accurate estimations. The Wald statistic is used to test the null hypothesis that the coefficient is equal to zero. A larger Wald statistic suggests stronger evidence against the null hypothesis. The predictor variables research and benchmarking indicated the largest Wald statistics of 7.142 and 10.067, respectively. Suggesting they have a strong influence on the textile MSE performance.

A p-value less than the significance level of .10 indicates that the coefficient is statistically significant and provides evidence against the null hypothesis. The test results indicated p-values of .008 and .002 for benchmarking and research, respectively, therefore confirming that the two independent variables strongly influence the textile MSE performance.

The Odds Ratio indicates the chances (odds) that a result will occur with a specific exposure compared to the chances of that result occurring without exposure. An odds ratio greater than 1 suggests that the odds of the outcome variable increase as the

predictor variable values increase, whereas an odds ratio less than 1 indicates that the odds decrease.

The odds of a Textile MSE creating unique/new innovative products (performance) as a result of increased use of the benchmarking strategy will not improve performance. Indicated by the test results, where the predictor variable coefficient value (B) was negative (-.997) with an odds ratio value of .369 at a 90% confidence interval (CI) of .178 to .767. This means that benchmarking is beneficial to the performance of textile MSEs to a significant level (.008), but increased (intensive) use will most likely result in copying and imitation with no new product innovations (-.997). This suggests that for best performance, other strategies also need to be applied.

The odds of a Textile MSE creating unique/new innovative products (performance) as a result of increased use of the research activity strategy will improve. Indicated by the test results, where the predictor variable coefficient value (B) was positive (1.291) with an odds ratio value of 3.637 at a 90% confidence interval (CI) of 1.638 to 8.075. This means that research is beneficial to the performance of textile MSEs to a significant level (.002), and increased use of research will improve performance (new product innovations).

Appendix I: Lambda Value Strength Range Guide

Guidelines for Interpreting the Strength of Association for Lambda, Gamma, and Pearson's R

Strength of Association	Value of Lambda ^a , Gamma, Pearson's r
None	0.00
Weak association	$\pm .01 - .09$
Moderate association	$\pm .10 - .29$
Evident of strong association	$\pm .30 - .99$
Perfect association, strongest possible	± 1.00

a: Lambda can only have a positive value

Source: SUNY Empire State University, 2023

Appendix J: Variables in the Study and Procedures of Measurement

Variables and Procedures of Measurement

Variables	Procedures of Measurement
<p>Independent Variable</p> <p>Design Strategies</p> <ul style="list-style-type: none"> - Creativity - Innovation 	<p>The types and variations of the use of strategies by the textile MSEs were shown using descriptive statistics. The data was visualized in tables, graphs and charts using SPSS and Microsoft Excel</p> <p>Chi-square “Goodness of Fit Test” test was used to measure the variation in the type of product design strategies used by the enterprises.</p>
<p>Intervening Variable:</p> <p>Design Management</p> <ul style="list-style-type: none"> - Knowledge - Competency - Environment 	<p>The intervening variable analysis was shown using descriptive statistics. The data was visualized in tables, graphs and charts using SPSS and Microsoft Excel</p>
<p>Dependent Variable:</p> <p>Performance</p> <ul style="list-style-type: none"> - New Products 	<p>Three frequent measures of innovation are; product/technological measures, financial measures and subjective measures (Denti, 2014). While Loof & Heshmati, (2006) asserts that two ways to measure innovation output are by; (1) the percentage of sales from new products, and by (2) the number of patents or product announcements.</p> <p>This study on the textile MSEs limited the. Performance measure of innovation to the number of new products.</p> <p>Analysis was by descriptive statistics. The data was visualized in Tables, graphs and charts using SPSS and Microsoft Excel. Inferential analysis of performance used the Chi-square “<i>Goodness of Fit-Test</i>” test (to determine the variation of Product innovation output). To test the influence of the strategies on the performance. <i>Multiple Logistic Regression</i> test was used to establish the influence of the independent variables on the dependent variable.</p>

Source: Author. 2020

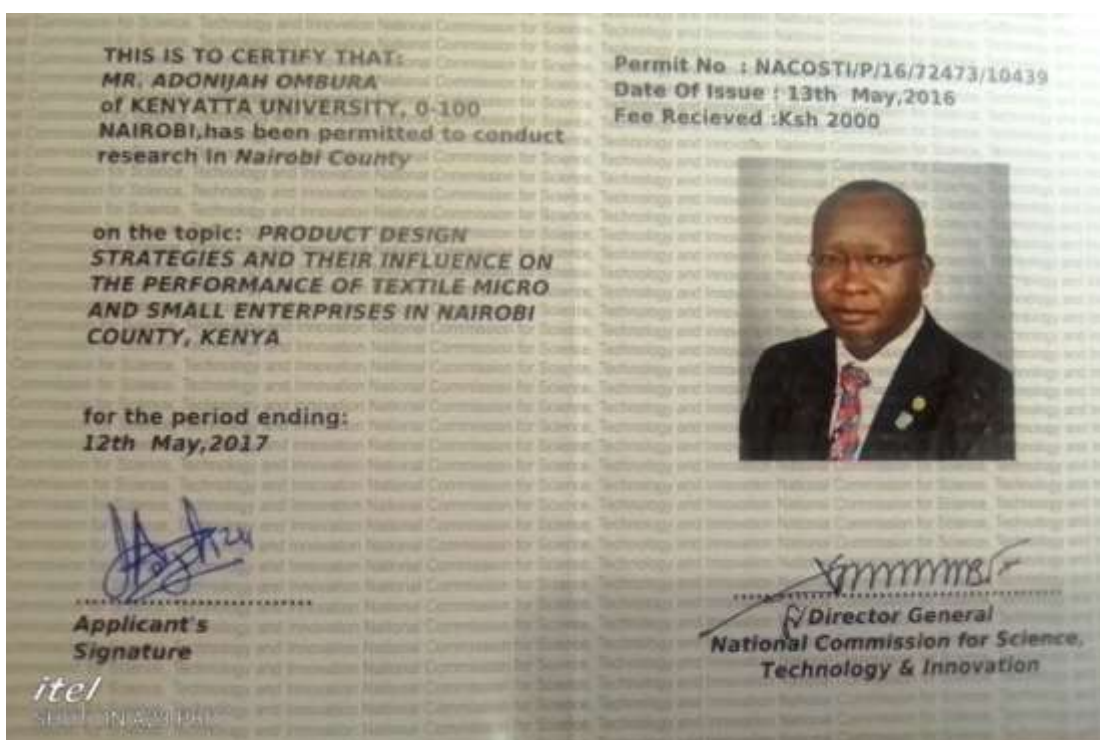
Appendix K: Research Authorization Documents

1. Research Permit

Permit used during main research survey in CBD Nairobi City County. (2018-2019)



Permit used during Pilot Survey in Roysambu sub-county. Nairobi. (2016-2017)



2. NACOSTI Research Authorization



**NATIONAL COMMISSION FOR SCIENCE,
TECHNOLOGY AND INNOVATION**

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2241349, 3318571, 2219420
Fax: +254-20-318265, 318268
Email: info@nacosti.go.ke
Website: www.nacosti.go.ke
when replying please quote

9th Floor, UMO House
Uhuru Highway
P.O. Box 30623-00100
NAIROBI-KENYA

Ref. No
NACOSTI/P/16/72473/10439

Date
13th May, 2016

Adonijah Ombura Ombura
Kenyatta University
P.O. Box 43844-00100
NAIROBI.

RE: RESEARCH AUTHORIZATION

Following your application for authority to carry out research on *“Product design strategies and their influence on the performance of Textile Micro and Small Enterprises in Nairobi County, Kenya.”* I am pleased to inform you that you have been authorized to undertake research in Nairobi County for the period ending **12th May, 2017.**

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

On completion of the research, you are expected to submit **two hard copies and one soft copy in pdf** of the research report/thesis to our office.


BONIFACE WANYAMA
FOR: DIRECTOR-GENERAL/CEO

Copy to:

The Principal Secretaries
Selected Ministries.

The County Commissioner
Nairobi County.

COUNTY COMMISSIONER
NAIROBI COUNTY
P. O. Box 90124-00100, NBI
TEL: 341006

The County Director of Education
Nairobi County.



3. Substantive Registration (PhD)



KENYATTA UNIVERSITY
OFFICE OF THE REGISTRAR (ACADEMIC)
P.O. BOX 43844 – 00100 NAIROBI
TEL: 8703222/23
Email: admissions-pg@ku.ac.ke

OUR REF: M88/20008/2010

DATE: 19TH FEBRUARY, 2016

Ombura Adonijah
C/O - Fine Art Department
KENYATTA UNIVERSITY.


Dear Ombura,

RE: SUBSTANTIVE REGISTRATION (Ph .D)

Following the recommendation by the Dean, Graduate School, you are hereby granted substantive Ph.D. registration.

Please note that your registration number and all rules and regulations remain the same as per your admission letter.

Thank you.



J. LIKAM
FOR: REGISTRAR (ACADEMIC)

Cc Dean, School of Visual & Performing Arts
Dean, Graduate School
Chairman, Fine Art Department

JL/jn.

4. Kenyatta University Research Authorization



**KENYATTA UNIVERSITY
GRADUATE SCHOOL**

E-mail: dean-graduate@ku.ac.ke

Website: www.ku.ac.ke

P.O. Box 43844, 00100
NAIROBI, KENYA
Tel. 8710901 Ext. 57530

Our Ref: M88/20008/10

DATE: 10th February 2016

The Director General,
National Commission for Science, Technology
& Innovation
P.O. Box 30623-00100,
NAIROBI

Dear Sir/Madam,

RE: RESEARCH AUTHORIZATION FOR ADONIJAH OMBURA- REG. NO. M88/20008/10

I write to introduce Mr. Adonijah Ombura who is a Postgraduate Student of this University. He is registered for Ph.D degree programme in the **Department of Fine Art & Design**.

Mr. Ombura intends to conduct research for a Ph.D Proposal entitled, "**Product Design Strategies and their Influence on the Performance of Textile Micro and Small Enterprises in Nairobi County, Kenya**".

Any assistance given will be highly appreciated.

Yours faithfully,


MRS. LUCY N. MBAABU
FOR: DEAN, GRADUATE SCHOOL