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The Influence of mass customization capabilities on operational performance of multinational manufacturing firms in Kenya

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The Influence of Mass Customization Capabilities on Operational Performance of Multinational Manufacturing Firms in Kenya

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DECLARATION

I declare that this thesis is my original work and has not been presented to any other university for a ward of a degree. Any work done by other people has been duly acknowledged. To the best of my knowledge and belief, the thesis contains no material previously published or written by another person. It has been examined by a board of Examiners of the Strathmore University

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6th June 2017

APPROVAL

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ABSTRACT

The manufacturing sector in Kenya is faced with stiff competition from local and international sources. Customer needs are not only dynamic but also heterogeneous hence a firm must find ways to provide goods that match the needs of a target market at a given time. In order to survive, manufacturing firms need to build mass customization capabilities that will enable them to meet dynamic and diverse customer needs for a particular market. The purpose of this study was to analyze the influence of mass customization capabilities on operational performance of multinational manufacturing firms in Kenya. The specific objectives included: to examine the extent of adoption of mass customization capabilities by multinational manufacturing firms in Kenya, to assess the influence of solution space development on operational performance of multinational manufacturing firms in Kenya, to establish the influence of robust process design on operational performance of multinational manufacturing firms in Kenya and to assess the influence of customer choice navigation on operational performance of multinational manufacturing firms in Kenya.

Data was collected by use of questionnaires from the target population of 93 multinational manufacturing firms in Kenya. Descriptive statistics, correlation analysis and multiple correlation analysis were used to analyze the data. Results showed that solution space development was the most widely adopted mass customization capability followed by robust process design then customer choice navigation as evidenced by their overall mean scores. On influence of each mass customization capability on operational performance, solution space development and robust process design were not statistically significant in explaining changes in operational performance while customer choice navigation had a significant positive influence on operational performance. Results on the synergetic influence of mass customization capabilities on operational performance however showed that customer choice navigation and robust process design had a significant positive influence on operational performance while solution space development was not statistically significant. The study however had limitations, in that it was cross sectional and therefore was not expected to capture mass customization capabilities developments and operational performance changes that come with the passage of time since these variables are not static.

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LIST OF ABBREVIATIONS AND ACRONYMS

ANOVA- Analysis of variance

CCN- Customer Choice Navigation

GDP- Gross Domestic Product

MC- Mass Customization

MCC- Mass Customization Capability

MNC- Multi-National Corporation

RPD- Robust Process Design

SSD- Solution Space Development

VIF- Variance Inflation Factor

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CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

Mass customization (MC) is becoming an increasingly widespread concern among companies with increase in competitive pressure (William & Ryan, 2009; Kristal, Huang & Schroeder, 2010). Mass customization is a competitive business strategy that focuses on low cost, high quality and large volume of customized products and services (Pine, 1993; Duray, 2002; Piller, 2014). According to Liu, Shah and Schroeder (2012) heterogeneous customer needs have splintered traditional mass markets into smaller niches leading to an immense interest in mass customization among manufacturing firms. Mass customization provides the ability to fulfil each customer's individual needs without substantial trade off in cost, delivery and quality (McCarthy, 2004; Piller, Diener & Luttgens, 2015). A trend towards individualization is growing especially in the millennial generation with a desire for offerings that cater for heterogeneous needs and personalities (Howe & Strauss, 2000). The trend is fuelled by the growth in social media that fosters company-customer interaction and collaboration (Harzer, 2013). In view of this, mass customization has grown from a niche strategy to an imperative for many companies (Pine, 2009; Gownder et al., 2011; Su & Huang, 2016).

According to Salvador, Holan and Piller (2009) mass customization is not about achieving some idealized state in which a company knows exactly what each customer wants, and can develop those goods at mass-production costs. Rather, it is about developing a set of capabilities that will, over time, supplement and enrich an existing business. Achieving superior performance by applying mass customization in manufacturing involves developing multidimensional strategic capabilities in a continuous process (Van Hoek, Voss & Commandeur, 1999). Strategic capabilities refer to the managerial ability of a firm to utilize its existing resources in a manner that creates value (Prahalad & Hamel, 1990; Amit & Schoemaker, 1993). Adopting mass customization requires shifts in operational strategy and this means that strategic decisions have to be made prior to decisions on operational processes in building mass customization capability (Alptekinoglu & Corbett, 2008).

Mass customization is a widely studied concept however there are diverse interpretations of what the concept means (Spring & Dairymple, 2000). For manufacturing firms, MC is the ability to manufacture a relatively high volume of product options for a relatively large market without substantial tradeoffs in cost, delivery and quality (McCarthy, 2004).

The concept of operational competence is embodied within the definition of mass customization indicating a paradigmatic departure from the classical operational strategy literature that postulates that manufacturers should trade off some of their individual operational competitive dimensions in order to achieve success (Roth, 1996). It is possible to pursue multiple competitive dimensions in operational competence because capability in one dimension enhances capabilities in other dimensions (Flynn & Flynn, 2004). Operational competence is a mass customization success factor (Kristal et al., 2010) that connotes a manufacturer's ability to excel in multiple operational competitive aspects including quality, cost, flexibility and delivery (Hallgren, 2007).

Although the importance of the firm performance concept is widely recognized, the treatment of performance in research setting varies across studies even in the same subject area (Campbell, 1977; Goodman & Pennings, 1977; Connolly, Conlon & Deutsch, 1980). Firm performance is multifaceted with different scholars defining and measuring it differently. One of the most common conception of firm performance centers on the use of financial indicators that are assumed to reflect the fulfillment of the economic goals of a firm (Hofer, 1983). These indicators include return on investment, profitability and earnings per share among others (Smart & Conant, 1994; Hooley et al., 1999; Hofer, 1983; Fahy et al., 2000; Moore & Fairhurst, 2003). A broader conceptualization of business performance however, includes emphasis on indicators of operational performance (Kaplan & Norton, 2001; Ethiraj et al., 2005; Busi & Bititci, 2006; Creuz-Ros et al., 2010). Operational performance is a non-financial framework that includes indicators such as product quality, cost efficiency, delivery speed and manufacturing value added among others (Venkatraman & Ramanujam, 1986).

Manufacturing performance assessment at plant level is more relevant when measured using operational performance indicators to determine if set objectives and standards are being meet progressively before a plant can contribute to the overall firm performance (Honneycutt et al., 1993; Schroeder, 1995; Wathen, 1995). In mass customization manufacturing domain, measures of operational performance are the most commonly used to determine if the strategic decision to mass customize is sound (Su, Chang & Ferguson, 2005; Liu et al., 2012). Scholars assert that the concept of operational competence is also embodied within the definition of mass customization (Roth, 1996; Kristal et al., 2010). March and Sutton (1997) assert that financial performance is elusive because it is affected by multiple variables simultaneously making any investigation limited in terms of controls. According to Ray (2004), top level measures such as financial performance may lead to misleading conclusions especially when using resource based theory. This study thus views firm performance from an operational perspective. Operational performance in manufacturing context is taken to refer to measurable aspects such as quality, cost, flexibility and delivery speed and reliability (Hallgren, 2007).

There are three schools of thought regarding the influence of mass customization capabilities on operational performance. The first school of thought argues that mass customization is associated with enhanced operational performance (Westbrook & Williamson, 1993; Kotha, 1995; Lau, 1995; Barman, 2002; Svensson & Barford, 2002). This is based on the argument that MC reduces variable costs because it is characterized by lower inventory, lower obsolescence and less inventory handling costs leading to an improvement in operational performance (Broekhuizen & Alsem, 2004).

The second school of thought refutes this positive relationship between mass customization capabilities and operational performance. This school argues that mass customization is associated with higher unit costs because it is characterized by a lower volume of each item in a product line and higher complexity in manufacturing operations (Worren, Moore & Cardona, 2002; Gracia & Winkelhues, 2016). According to this view, since mass customization involves higher uncertainty than mass production, a firm's operational performance ordinarily deteriorates (Duray, 2002; Squire, Brown, Readman & Bessant, 2006).

The third school of thought is on the nature of the relationship between mass customization capabilities and operational performance. Some scholars argue that the relationship between mass customization and operational performance is not direct but depends on the synergy between mass customization capabilities (Liu, Shah & Schroeder, 2012; Piller et al., 2014). This means that each of the strategic mass customization capabilities are not statistically significant in explaining changes in operational performance when assessed individually but are significant when aggregated together (Piller et al., 2014). Other scholars however assert that mass customization capabilities have both a direct and indirect influence on operational performance (Zhang, Qi, Zhao & Duray, 2015). Based on these three schools of thought there is no agreement on the relationship between mass customization and firm performance.

Research on the mass customization manufacturing subject generally has widely been from developed countries' perspective. This is probably because manufacturing practice is more advanced and concentrated in developed countries than in developing countries (African Development Bank, 2016). Developing countries are increasingly adopting strategies and expertise such as mass customization from developed countries and multinational firms tend to be pathways for transferring such practices (Bartels, Buckley & Mariano, 2009). This study sought to investigate mass customization capabilities' influence on a firm's operational performance from a developing country perspective. The study focused on manufacturing multinationals in Kenya which are assumed to aid in knowledge transfer on the use of advanced production techniques and methodology from their home countries to foreign countries where subsidiaries exist.

1.1.1 Mass Customization Capabilities

Mass customization capabilities refer to a company's ability to design systems capable of collecting and using highly uncertain information on product requirements in order to produce a corresponding range of required products (McCarthy, 2004).There are many mass customization capabilities that can be identified from literature however the ability to transform a firm into a competent mass customizer depends principally on three strategic capabilities (Salvador et al., 2009; Piller, Salvador & Walcher, 2012). These include robust process design, solution space development and customer choice navigation.

Robust process design capability points to the ability to reuse or recombine existing organizational and value chain resources to fulfil diverse customer needs (Nielsen & Brunoe, 2014). Solution space development capability refers to the ability to identify areas along which customer needs vary (Nielsen & Brunoe, 2014). Customer choice navigation capability refers to the ability to support consumers in identifying their own solutions while minimizing complexity of the co-design process (Nielsen & Brunoe, 2014).

A firm that has mastered each of these three capabilities has increased probability of being a competent mass customizer (Salvador et al., 2009; Thorsten, Simon & Harzer, 2013; Piller et al., 2014). Although the three fundamental mass customization capabilities are identified and explained theoretically, manufacturing companies face challenges when evaluating these capabilities to determine their performance levels since no comprehensive methods are available to serve this purpose (Nielsen & Brunoe, 2014).

1.1.2 Mass Customization in the Manufacturing Industry

This study's interest in the manufacturing sector originates from the belief that the sector is, among other things, a potential engine of modernization and a creator of jobs (Tybout, 2000). Historically, the growth in manufacturing output has been a key element in the successful transformation of most economies that have seen sustained rises in their per capita incomes (African Development Bank, 2016). In Africa, performance in this area has been particularly poor over the last decades (Kenya Bureau of Statistics Economic survey, 2016). In Kenya, manufacturing accounts for 11 per cent of the GDP, which is low compared to most middle income countries, yet enough to make it the most manufacturing-intensive economy in Eastern Africa (Kenya Bureau of Statistics Economic survey, 2016). The use of competitive manufacturing paradigms such as mass customization have potential to capture unique customer needs and reduce overreliance on imported goods.

Despite the fact that developed countries are at an advanced stage in terms of manufacturing technologies employed and the product life cycle as compared to developing countries (African Development Bank, 2016), we have global trade and global customers who are linked through information, transportation and communication technologies which are real in the 21st century. Strategies and expertise can be transferred into developing countries from developed countries through multinational firms (Bartels, Buckley & Mariano, 2009) to help meet the needs of a globally exposed customer. The transfer of strategies from a multinational company to a foreign company may be carried out as is or with modifications depending on unique market characteristics (Venkatraman, 2001). This means that it may not be enough to study a company's strategies only from a home country point of view because of the different practical interpretations a concept can take in different geographical, economic and cultural contexts (Kokko & Thang, 2014).

The presence of multinational manufacturing plants in developing countries is important because it helps in transferring knowledge and working practices which may lead to higher productivity and competitiveness from developed to developing countries (Godart & Gorg, 2013; Kokko & Thang, 2014; Gorg & Seric, 2016). According to African Development Bank report (2014), Africa's share in world-wide trade in value added, as a measure of the involvement in global supply chains, was 1.4 percent in 1995 and grew to 2.2 percent in 2011. While this is still not particularly high (it is 5.9 percent in Europe and 11.8 percent in North America in 2011), there is an upward trend. Mass customization manufacturing can offer a way to improve manufacturing performance for developing countries by meeting customers' idiosyncratic needs. Customers will also find reason to buy locally made customized products. An important issue for Sub-Saharan Africa is how to realize the elusive productivity-enhancing benefits of knowledge and technology spillovers from foreign direct investments. The inability of many countries to manage the complex interplay of factors needed for local spillovers to emerge has resulted in little or no benefits from foreign investors (Farole & Winkler, 2014). The reality in many African countries has been disappointing, as knowledge spillovers have not taken place, and transfer of knowledge has been hampered by an overreliance on expatriates (Kamau, 2016).

The extent of adoption of mass customization in the manufacturing industry in Kenya is not known; however, empirical research has been carried out on some of the multinationals present in Kenya including Procter & Gamble, IBM and Coca Cola among others (Piller & Tseng, 2010). This however was done in European countries context although the same mass customization practices are also carried out in Kenya. Research on mass customization in Kenya has been done in the context of the hospitality industry where Ayuma (2011) investigated mass customization as a business strategy for five-star hotels in Nairobi. There is however anecdotal evidence of the use of mass customization among multinational manufacturing firms in Kenya. For instance, the coca Cola subsidiary in Kenya has been huge on customizing cans and plastic bottles with names of customers in a move dubbed "share a coke with…" (cocacolasabco.com, 2017). This is an example of cosmetic customization whereby the product remains standard while its wrapping is customized.

Another example in Kenya is that of DT Dobie, a motor vehicle assembling firm that offers customized long wheel base vehicles that are equipped with reinforced suspensions for rough road use and have an aluminum underside guard for engines and transmissions for the Kenyan market (dtdobie.co.ke, 2017). They also offer pick-ups whose sides are hinged to provide quick loading for goods, building materials and machinery. This feature in Kenya has special appeal for construction companies, farmers and transporters making deliveries to shops and warehouses (dtdobie.co.ke, 2017). Mass customization should however not only be linked to consumer goods but also to business-business customers who need specific products to help complete their manufacturing process (Ahlstrom & Westbrook , 1999).

1.1.3 Manufacturing Sector in Kenya

The manufacturing sector in Kenya accounted for about 11 percent of the gross domestic product (GDP) in 2016 (World Bank, 2016). Since the 1980s, the manufacturing sector contribution to the GDP has been greatly fluctuating. In 1980 it accounted for 21 percent of Kenya's GDP, in 1990 decreased to about 19 percent and in 2000 decreased to about 17 percent (World Bank, 2016). In 2011 there was a slight increase to 17 percent in the manufacturing contribution to GDP however the situation has been dwindling (Kenya Bureau of Statistics Economic survey, 2016).

About half of the investment in Kenya's manufacturing sector is foreign and multinational corporations play an important role in Kenya's economy (Kenya Investment Authority, 2017).

According to Kenya Association of Manufacturers (2016) there are about 853 manufacturing firms in Kenya. These include small and medium sized firms, large firms, transnational firms and multinational firms. The legal framework for foreign direct investments is provided by the Foreign Investment Protection Act, the Companies Ordinance, the Partnership Act and the Investment protection Act. Legally, multinational corporations are accorded the same treatment as local companies (Kenya Investment Authority, 2017).

A major challenge facing the manufacturing sector in Kenya is poor utility infrastructure whereby the cost of power is expensive and experiences surges and blackouts (Kamau, 2016). Heavy taxes are also imposed on manufacturing companies and eats into their profit margins (Were, 2016). Heightened competition affects the manufacturing sector negatively especially in the case of unfair competition caused by import dumping (Nthiiga, 2016). Deteriorating operational performance is also a challenge cited by manufacturing companies in Kenya (Kamau, 2016; Nthiiga, 2016). An assessment on operational performance of multinational manufacturing firms in Kenya, found that 85 percent of 95 firms studied experienced decreased operational performance (Nthiiga, 2006). In the recent past, multinational manufacturing firms such as Cadburys and General Electric have shifted a large portion of their manufacturing processes to Egypt from Kenya (Were, 2016).

1.2 Problem Statement

There are many mass customization capabilities that can be identified from literature however the ability to transform a business into a successful mass customizer hinges primarily on three strategic capabilities namely; solution space development, robust process design and customer choice navigation (Salvador, De Holan & Piller, 2009; Piller, Salvador & Walcher, 2012; Nielsen, Brunoe & Storbjerg, 2013). A firm that has mastered each of these three capabilities stands a better chance of succeeding as a mass customizer (Salvador & Walcher, 2012; Piller et al., 2014). The extent of adoption of these capabilities in Kenya is however not documented although there is anecdotal evidence of their use.

A challenge for manufacturers has been to maintain low operational cost in a high demand uncertainty environment resulting from offering mass customized products (Trentin et al., 2012). There are however mixed empirical findings on the relationship between mass customization capabilities and operational performance. While some scholars argue that mass customization capabilities are associated with enhanced firm performance (Westbrook & Williamson, 1993; Kotha, 1995; Lau, 1995; Barman, 2002; Wang, Wang & Zhao, 2015) other scholars refute this positive relationship and argue that mass customization capabilities are associated with deteriorating firm performance (Worren, Moore & Cardona, 2002; Duray, 2002; Squire et al., 2006). As to the nature of the relationship between mass customization capabilities and firm performance, some scholars argue that it is of second order and depends on the strength of the synergetic contribution of mass customization capabilities towards operational performance (Piller et al., 2012; Liu et al., 2012) while others argue that direct influence of each MC capability towards operational performance is also possible (Zhang et al., 2015). There is therefore no agreement on the relationship between mass customization capabilities and firm performance and empirical studies are needed to further look into this relationship.

The benefits of mass customization capabilities as strategic concepts have widely been discussed within literature. However, the operations of mass customization capabilities and their field implementation have not been dealt with sufficiently by researchers (Ahlstrom & Westbrook, 1999; Blecker & Friedrich, 2007). The idea of mass customization is very promising in theory but in practice it may be very different (Blecker & Friedrich, 2007). Business literature has reported some mass customization failures which led companies to abandon the strategy (Agrawal, Kumaresh, Mercer & Glenn, 2001). Conceptualization and measurement of mass customization capabilities and operational performance differs across industries and this could explain difference in findings across studies (Piller, 2006; Wang et al., 2015).

Despite the widely accepted view that mass customization presents a competitive business strategy, little has been done to document the influence of mass customization capabilities on operational performance in Kenya in the context of the manufacturing industry. The few studies on mass customization in Kenya are in the service sector context of the hotel industry in Kenya. For instance, Ayuma (2011) investigated mass customization as a business strategy for five-star hotels in Nairobi and found that individual mass customization strategies may not be significant for hotels but the combination of strategies was beneficial. There is therefore need to investigate the influence of mass customization capabilities on operational firm performance in Kenya's manufacturing context.

1.3 Research Objectives

The main objective of this study was to analyze the influence of mass customization capabilities on operational performance among multinationals in the manufacturing industry in Kenya.

1.3.1 Specific Objectives

1. To examine the extent of adoption of mass customization capabilities by multinational manufacturing firms in Kenya.

2. To assess the influence of solution space development on operational performance of multinational manufacturing firms in Kenya.
3. To establish the influence of robust process design on operational performance of multinational manufacturing firms in Kenya.

4. To assess the influence of customer choice navigation on operational performance of multinational manufacturing firms in Kenya.

1.4 Research Questions

1. What is the extent of adoption of mass customization capabilities by multinational manufacturing firms in Kenya?

2. What is the influence of solution space development on operational performance of multinational manufacturing firms in Kenya?

3. What is the influence of robust process design on operational performance of multinational manufacturing firms in Kenya?

4. What is the influence of customer choice navigation on operational performance of multinational manufacturing firms in Kenya?

1.5 Significance of the Study

An examination of the relationship between mass customization capabilities and operational performance may provide important managerial implications for manufacturing practitioners. Managers for example will be placed at a better position to decide whether to apply mass customization capabilities based on the nature of the relationship between different mass customization capabilities investigated in objectives two, three and four and operational performance. The achievement of the study objective two, three and four will also help manufacturing firms utilizing huge budgets on different strategic capabilities that do not yield good results to invest in specific capabilities that will enhance their performance.

Academicians will also benefit from the findings of all four objectives because they attempt to explain the influence of mass customization capabilities on operational performance from a developing country point of view. This research only partially tries to fill this knowledge gap and further studies would help shed more light.

1.6 Scope of the Study

This study focused on 93 multinational manufacturing firms in Kenya (KAM, 2017). This is the entire population of multinational manufacturing firms in Kenya.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter looks at past studies done by other researchers relating to mass customization capabilities and operational firm performance. The chapter is divided into four sections. In the first section, the following theories are discussed and applied in mass customization manufacturing context; the resource based view of a firm, capabilities theory and the cumulative model of competitive capabilities in manufacturing performance. The second section is an empirical review based on the study objectives. The third brings out the research gap and finally the fourth section contains the conceptual framework that links mass customization capabilities to operational firm performance.

2.2 Theoretical Framework

There are many theories that have been used to relate mass customization capabilities to operational performance however, the theoretical framework of this study is anchored on three commonly used theories in mass customization manufacturing context (Piller, Moeslein & Stotko, 2004; Squire at al., 2006; Liu et al., 2011; Thorsten, 2013). These are the resource-based view (RBV), capabilities theory and cumulative model of competitive capabilities in manufacturing performance. For this study, the resource based view is applied to explore possible reasons behind the mixed fortunes of mass customization business ventures. Capabilities theory is applied in a complementary manner to RBV to add that firms achieve superior performance by being more effective than their competitors in deploying resources and not by merely having valuable resources. Cumulative model of competitive capabilities in manufacturing performance gives insight of how operational performance metrics are gained in a sequential manner to finally contribute to improved operational performance.

2.2.1 Resource-based View of the Firm

The resource based view of the firm (RBV) attributes superior performance and competitive advantage of a firm to the resources that the firm possesses (Wernerfelt, 1984; Barney, 1986). Resources include the tangible and intangible assets that a firm possesses, has access to or has control of (Helfat & Peteraf, 2003). Two fundamental assumptions are made for this theory to hold. One that resources are heterogeneous such that no two firms have exactly the same resources and secondly that the resources are immobile (Barney, 1991). According to this theory, for competitive advantage to emerge and stand the test of time the resources must meet the VRIN criteria (Barney, 1991). This is an acronym that represents the following concepts: Valuable; resources must allow the organization to deploy a value-creating strategy by exploiting opportunities that lie in the market or by neutralizing threats in the environment. Rare; for competitive advantage to exist, valuable resources that a firm has must not be possessed by competitors. In-imitable; valuable and rare resources that a firm has should not be easy for competitors to replicate perfectly. Non-substitutable; in addition to being valuable, rare and not easy to imitate, there must be no strategically equivalent resources that enable competitors to employ a similar strategy.

Previous studies have established that mass customization capabilities meet the VRIN criteria and hence enable a firm to achieve superior performance relative to competitors (Gensheng, Rachna & Roger, 2012). This study applies the RBV theory because it provides possible reasons for performance differences among mass customizing firms. RBV theory provides an efficiency based explanation of performance differences among firms that are attributable to resources inherently having different levels of efficiency in the sense that they enable the firms to deliver greater benefits to the customers for a given cost (Conner, 1991; Peteraf, 1993; Teece, Pisano & Shuen, 1997; Peteraf & Barney, 2003). Zipkin (2001) argues that mass customization is not a universal strategy and can only benefit firms that have built the appropriate competence.

Despite its contribution to explaining performance differences among firms, RBV theory has been criticized for the following reasons; its assumption of heterogeneity of resources, its unit of analysis, the tautological nature of the theory and neglect of the firm's environment (Foss, 1998; Eisenhardt & Martin, 2000). According to Eisenhardt and Martin (2000) resources have been found not to be as heterogeneous as previously assumed. Foss (1998) addressed the appropriateness of the unit of analysis of RBV that is often taken as the individual resource. He goes on to point out that this may only be legitimated if the relevant resources are adequately well-defined and free-standing. If, in contrast, there are strong levels of complementarity and co-specialization among resources, the way resources are clustered and how they interplay is what that should be important to the understanding of competitive advantage and superior performance.

RBV is also criticized for its tautological or self-confirming nature. Priem and Butler (2001) postulate that RBV used circular reasoning such that competitive advantage is defined in terms of value and rarity and the resource characteristics put forward to lead to competitive advantage are also value and rarity. This is therefore operationally invalid and is a statement that cannot be disputed (Priem & Butler, 2001). On the issue of neglect of the environment, Foss (1998) postulated that the RBV need not restrict its domain of application to the firm. It may add some more fine-grained analysis to the understanding of industry-level competitive dynamics, for instance, by directing attention to the resources that underlie barriers to mobility and entry.

Conclusively, RBV theory does make an important contribution to explain performance differentials among firms however, the concept of capabilities better addresses the clustering and interplay of resources within firms (Eisenhardt & Martin, 2000). This differentiation between resources and capabilities calls for further explanation which is provided by the capability-based view of competitive heterogeneity.

2.2.2 The Capability-based View of Competitive Heterogeneity

The capability-based view of competitive heterogeneity postulates that a firm's competitive position is influenced by unique knowledge and experience possesses by its members, unique relationships among the members and routine processes that make it hard for competitors to discern the source of a firm's performance (Richardson, 1972). This theory emphasizes on the manner in which an organization's resources are deployed in order to create value for the firm such that the firm that attains superior performance is the one that is more effective in deploying resources relative to its rivals (Cater, 2004). According to this theory, competitive advantage and superior performance can be achieved by transforming key business processes of a firm into hard-to-imitate strategic capabilities. Capabilities in this theory mean organizationally entrenched, non-transferable resources whose purpose is to improve the productivity of other resources possessed by the organization (Makadok, 2001).

Performance differentials in this theory can also be explained from co-specialization of strategic capabilities (Milgrom & Roberts, 1995; Lippman & Rumelt, 2003). This refers to the relationships and coalitions between different strategic capabilities within a firm that cause the whole effect on performance to be more than the sum of individual capabilities effect on performance (Lippman & Rumelt, 2003). Coalitions of these capabilities yield higher payoffs than the members could earn by themselves (Adegbesan, 2009). Varying patterns of complementarities among strategic capabilities explain performance differences among firms. This theory is used in this study in a complementary manner to RBV to add that firms achieve superior performance by being more effective than competitors in resource deployment. Conclusively, this theory also is not full proof since there are multiple non-resource factors, such as entry conditions and external relationships that influence capability development (Hoopes & Madsen, 2008).

2.2.3 Cumulative Model of Competitive Capabilities in Manufacturing Performance

Nakane (1986) put forward the cumulative model or the sandcone model of manufacturing performance to explain how manufacturing performance is achieved. According to this theory, manufacturing performance is cumulative and progressive with quality performance forming the foundation of a competitive firm performance (Nakane, 1986). Firms can improve on manufacturing performance on multiple fronts because the improvements build on to each other (Corbett & Van Wassenhove, 1993).

Nakane (1986) postulates that quality improvement is the basis of all other improvement followed by dependability. Dependability improves when a firm has achieved quality performance (Ferdows & De Meyer, 1990). Quality and dependability are preconditions to cost efficiency improvements. Flexibility improvements can only be achieved if a company has quality, dependability and cost efficiency under control (Nakane, 1986; Ferdows & De Meyer, 1990).

This theory is applied in this study because it captures the manufacturing performance measurements that have been identified as the most important operational measures of performance. These measures have been widely studied to an extent that several theories have been formed around them (Kristal et al., 2010). Such theories include the trade-off theory of manufacturing performance and the cumulative model of manufacturing performance (Flynn & Flynn, 2004). The tradeoff theory is not applicable to this study because it goes against the mass customization promise of achieving multiple capabilities cumulatively without necessarily having to gain one at the expense of another.

The cumulative model of competitive capabilities in manufacturing performance however has been criticized for being rigid in stipulating the order of attainment of operational performance goals. Collins and Schmenner (1993) recognized the complementarity between operational performance goals but concluded that the goals need not be achieved in any order. Firms instead must be responsive to perform highly on any dimension.

2.3 Empirical Review

This section is divided into two parts, the first section describes mass customization capabilities used in mass customization. The second section discusses the influence of mass customization capabilities on operational performance of a firm.

2.3.1 Mass Customization Capabilities

Mass customization capabilities refer to the ability of a manufacturing firm to produce quality customized products on a large scale in a time and cost efficient manner (Tu, Vonderembse & Ragu-Nathan, 2001; McCarthy, 2004; Wang et al., 2015). There are many mass customization capabilities that have been identified by scholars however there is general agreement in literature that solution space development, robust process design and customer choice navigation are of strategic importance (Helander & Jiao, 2002; Salvador et al., 2009; Piller et al., 2012). This is because the three capabilities are generalizable and together cover the front end, back end and support infrastructure of a mass customization process (Helander & Jiao, 2002; Salvador et al., 2009; Piller et al., 2012). These three capabilities were proposed by Salvador et al., (2009) and tested in the context of manufacturing companies in Germany by Thorsten (2013). According to Salvador et al. (2009) these three strategic capabilities centrally determine the ability of a firm to benefit from mass customization. The three strategic capabilities are the main focus of this study and are discussed below:

2.3.1.1 Solution Space Development

Solution space development (SSD) is a back end manufacturing operation that relates to product platform design and product family modeling (Helander & Jiao, 2002). A firm seeking to adopt mass customization has to identify divergent product attributes and decide the degree of variety to offer and thus define the solution space. Successful implementation of SSD begins with product flexibility which involves identifying the most economical modules and maximizing on their reusability to offer variety within an identified solution space or 'envelop of variety' (Poulin et al., 2006).

Variety in can be in form of size or fit, color, flavor etc. (Piller & Stotko, 2003; Thorsten, 2013). In SSD, the customer's requirements are collected and their choice is guided by a relative set of attributes. The outcome of this process then influences the manufacturing processes such as planning, scheduling, and resource management at the back end. The result is improved operational performance that allows firms to serve individual customers efficiently. In practice, however, many firms lack the SSD capability and the solution space is often defined intuitively without much planning (Thorsten, 2013).

2.3.1.2 Robust Process Design

Robust process design (RPD) refers to stable production processes for delivering high variety products (Piller et al., 2014). RPD covers the infrastructure of the manufacturing process which is an important enabler for creating robust processes (Helander & Jiao, 2002). Increased variability in customer requirements can lead to significant deterioration in a firm's operations and supply chain (Blecker & Friedrich, 2007). To counter this, there must be a robust process design (RPD) so that customized goods can be delivered with near mass production efficiency (Salvador et al., 2009). A firm's production process is considered robust if it allows volume and mix flexibility (Piller, 2016). Volume flexibility is the ability to run different sizes of product batches profitably and effectively (Khouja, 1997; Jack & Raturi, 2002). Mix flexibility points to the ability to switch across product variants with low changeover costs (Li & Tirupati, 1997; Berry & Cooper, 1999). The robustness of the production system can be increased through postponement, flexible automation, process modularity and flexible personnel to contribute to a firm's operational performance (Thorsten, 2013).

2.3.1.3 Customer Choice Navigation

Customer choice navigation (CCN) is classified as a front end manufacturing operation that points to human-computer or human-human interaction and the decision making process for product customization (Helander & Jiao, 2002). CCN enables firms to support their customers design individual products in a simplified manner (Salvador et al., 2009). Interaction systems are considered important enablers for the successful implementation of customer choice navigation because they affect the outcome of mass customization (Blecker & Abdelkafi, 2007).

Web-based interaction systems can be very helpful however they are not the only way to enable customer choice navigation (Franke & Piller, 2003). Firms can rely on trained sales staff and unique store environments to interact with customers (Berger et al., 2005). The choice of a customer interaction method should however satisfy two things; it must minimize perceived complexity during the co-design process and generate a feeling of fun or excitement to customers (Franke & Piller, 2003). Because this capability is hard to develop, it resists imitation, and hence contributes to superior operational performance.

2.3.2 Influence of Mass Customization Capabilities on Operational Performance

The intended operational performance objective of mass customization capabilities is to facilitate firms to offer variety without them substantially trading off cost, quality or delivery efficiency (Lai, Zhang, Lee & Zhao, 2012). Operational performance is measured based on the responsibilities of a firm to plan and control quality, cost, flexibility and delivery functions of a manufacturing business (Ward et al., 1998; Lai et al., 2012).

Metrics for assessing mass customization capabilities should be readily available in a company and this is made easy by the presence of systems such as Enterprise Resource Planning (ERP), Materials Requirement Planning (MRP) and Product Life Cycle Management (PLC) systems among others (Nielsen & Brunoe, 2014). The main competitive priorities of operational performance in a manufacturing context include cost of products, quality of products, product delivery and production flexibility (Squire et al., 2006). These measures are aggregated together in this study to form operational performance and are discussed below.

Quality Performance

Quality performance is multifaceted and can be viewed from different perspectives such as features, conformance, durability, serviceability and aesthetics (Garvin, 1987; Squire et al., 2006). In the manufacturing operations domain, conformance dimension is the most widely used and refers to the manufacturing process' ability to produce products that match their predefined specifications reliably and consistently (Ward et al., 1996). A product that conforms to specifications minimizes scrap and rework (Lai et al., 2012).

Flexibility Performance

Flexibility performance is multi-dimensional and can be viewed from perspectives such as, volume flexibility, mix flexibility, design flexibility, process flexibility, new product introduction speed and material handling flexibility (Sethi & Sethi, 1990). Volume and mix flexibility are the most commonly used dimensions of flexibility performance because they are externally driven towards meeting the needs of the market (D'Souza & William, 2000; Hutchison & Das, 2007).

Delivery Performance

Delivery performance can be viewed from two main perspectives, delivery reliability and delivery speed (Ward et al., 1996; Squire et al., 2006). Delivery reliability relates to dependability and is exhibited by on-time deliveries (Berry et al., 1991). It concerns the ability to deliver according to a promised schedule. Delivery speed on the other hand is concerned with the length of the delivery cycle whereby the shorter the cycle, the better it is for a firm (Berry et al., 1991).

Cost Performance

Cost performance measures the amount of resources used to produce a product (Slack & Lewis, 2002; Boyer & Lewis, 2002). There are many dimensions that constitute cost performance and these include manufacturing cost, production plant running cost, service cost, value added cost and selling price among others (Foo & Friedman, 1992). Cost performance is of strategic importance however, there are managerial degrees of freedom in the distribution of cost reductions (Boyer & Lewis, 2002). Every coin removed from the production overall cost is a coin added to the bottom line profits (Slack & Lewis, 2002).

2.3.2.1 Solution Space Development and Operational Performance

Solution space development capability refers to a firm's ability to identify the attributes along which customer needs diverge (Nielsen & Brunoe, 2014). Solution space development capability makes it possible for firms to identify unique customer needs and meet them with appropriate product offerings (Salvador et al., 2009). Access to customer needs information is crucial in solution space development (Piller, Lindgens & Steiner, 2015). This is information about needs, preferences, desires and motives that help build an in depth understanding of the customer. Customer requirements can be satisfied along the following dimensions; design, fit and functionalities (Piller, 2006). Design relates to taste and form; fit relates to shape, measurement and size; functionalities relate with speed, precision and power (Piller, 2006).

Previous studies have found that firms that are able to effectively respond to identified customization needs of customers within a bracket of choice achieve their operational performance goals (Tu et al., 2001; Piller et al., 2014). This is because developing a working solution space reduces complexity, time wastage and cost of manufacturing that is brought about by increased variety thereby leading to improvement in operational performance (Huffman & Khan, 1998; Nielsen et al., 2013). Having a pool of customer needs information is a prerequisite in developing a working solution space. Information on different dimensions of design, fit and functionality gives a mass customizer an edge in demand forecasting which helps them plan in advance on how to achieve operational objectives such as high quality of products, flexible production operations, low production costs and swift delivery (Bhatia & Asai, 2015). Because of this, the capability of coping with variety and complexity is a necessary competence for organizations to pursue mass customization (Blecker et al., 2005).

A different school of thought however contends that solution space development is not easy and often leads to confusion (Pine, 1993; Huffman & Kahn, 1998; Squire et al., 2006). For example a customer might be so imaginative that they end up proposing a product that is not economically viable for the manufacturer or one that cannot move in volume. Scholars in this view argue that developing an envelope of variety to create an optimal solution space is a moving target (Squire et al., 2006). A manufacturer who has managed to access a large pool of customer information must analyze it to come up with the most profitable sets of variety to build into this envelop (Bhatia & Asai, 2006). Customer needs are however dynamic so solution space development is a continuous process (Piller, 2006). This might prove not to be cost effective yet a manufacturer must also ensure that they remain in business as they go about mass customizing products for the benefit of customers. Mass customized products often are sold at a price premium and hardly meet the operational dimension of cost efficiency (Tseng & Jiao, 2001).

On the nature of the relationship between solution space development and operational performance, Piller et al. (2014) contend that the relationship is not direct but depends on the contribution of all three strategic mass customization capabilities towards operational performance. Su and Huang (2016) support this view in their findings that solution space development has a second order influence on firm performance.

Controversy therefore exists on the influence of solution space development on operational performance. While one school of thought argues that complexity brought about by increased variety of products to satisfy heterogeneous needs can be managed within a working solution space, another argues that operational performance goals have to be sacrificed by mass customizing firms. There is therefore need to conduct further empirical analysis of this capability's influence on operational performance.

2.3.2.2 Robust Process Design and Operational Performance

Robust process design capability denotes that a firm reuses or recombines its resources to reduce trade-offs between variety and costs (Salvador et al., 2009; Piller et al., 2014). Manufacturing process design is considered robust if it is stable, responsive and provides a dynamic flow of products (Tu et al., 2001; Badurdeen & Masel, 2007).

Scholars who propose that robust process design improves operational performance argue that firms can do so by incorporating flexibility in the design phase of products that is possible through the postponement principle (Hoek, 2001; Piller et al., 2014). This principle implies moving customization efforts downstream close to the end users (Tseng & Jiao, 2001). This enables manufacturing firms to reuse components to fulfil unique customer requirements by reconfiguring standard modules to form a variety of products. This shortens cycle time, reduces customization cost, improves flexibility and leads to improvement in operational performance (Hoek, 2001; Tu et al., 2001).

According to this school of thought, value creation within robust processes is the main difference between mass customization and craft customization. Craft producers not only reinvent their products but also their production processes while mass customizers only use stable processes to deliver high variety goods within a pre-defined solution space (Piller et al., 2015). Additive manufacturing technologies such as 3D printing play a key role in helping to ensure robust process design (Piller et al., 2014). This calls for a shift from prototyping into use of 3D printing (Thorsten et al., 2013). Adaptive human resources also play a role in ensuring the process design is robust (Salvador & Piller, 2013). Employees have to be empowered to offset potential rigidities present in process structures and technologies. This school of thought argues that negative effects of introducing variations in production can be reduced by making the process design to be truly robust (Salvador & Piller, 2013). This is by making process design stable and at the same time responsive (Tu et al., 2001). With robust process design customized offerings can be delivered with near mass production reliability and efficiency (Salvador et al., 2009).

Contrary to the aforementioned arguments, scholars have also argued that an attempt to create a robust process design is based on trial and error and is a slow process hence often impairs operational performance goals of flexibility and cost (Piller et al., 2015). For example, during change over from one product to another, there is a stoppage in production process leading to wastage of time (Bhatia & Asai, 2015). Manufacturing firms have also to maintain inventory in warehouses which results to a large capital investment (Rautenstrauch et al., 2002). Tseng and Jiao (2001) add that increased variability in customers' demands causes manufacturing firms to incur significant lead time and costs along the supply chain which lead to deteriorated operational performance.

Mass customization triggers complexity in the production system which consists of two main subsystems (Rautenstrauch et al., 2002). The first is a push system that transforms raw materials into semi-finished products often according to forecasts. The second is a pull system which is customer-driven whose production does not occur according to forecasts. Complexity brought about by uncertainty at the pull system may contribute to delayed delivery of products, high cost of manufacturing and quality compromises (Thorsten et al., 2013).

As to the nature of the influence between robust process design and operational performance, Piller et al. (2014) and Su and Huang (2016) contend that this relationship can best be established as a second order construct that depends on the synergy brought about by the remaining two mass customization capabilities that are of strategic importance. Zhang et al. (2015) however refute this and find that robust process design has both direct and indirect relationship to firm performance. Conclusively, there is no agreement on the influence of robust process design on operational performance of firms.

2.3.2.3 Customer Choice Navigation and Operational Performance

Customer choice navigation capability on the other hand supports customers in creating their own solutions while reducing choice complexity, which facilitates the reduction of costs during the co-design process (Salvador et al., 2009). The traditional tools for customer choice navigation have been co-design toolkits, configurators and choice boards (Franke & Piller, 2004; Salvador et al., 2009; Hvam et al., 2008). These tools guide the user though the elicitation process and are not limited to software tools (Piller et al., 2015).

On the influence of customer choice navigation on operational performance, one school of thought argues that relying on acquired customer knowledge, manufacturers can accelerate the decision making process, reduce lead time and improve design flexibility hence lead to an improvement in operational performance (Zhang et al., 2015). The producer-customer co-design process offers an opportunity for building lasting customer relationships. This relationships increase revenue from each customer by turning them into repeat customers and increases their switching costs (Bhatia & Asai, 2015). Customer integration into the sales environment and continuous learning also play a part in improving operational performance of a mass customizing firm (Su & Huang, 2016).

Conversely, other scholars refute this positive relationship and argue that customer choice navigation negatively affects operational performance. This scholars recognize that access to customer information is not free (Piller, 2006). Costs incurs from customer interaction during the process of obtaining specifications from the consumers. This costs include heavy investment in technology to help pick measurements and specifications of customers (Bhatia & Asai, 2015). In order to build the customer choice navigation capability, manufacturers must first make investments to set up necessary technology or infrastructure to do this (Blecker & Abdelkafi, 2007). There is also time wastage in customer-producer co-design process because most customers cannot easily articulate what they want (Pine, 1993).

On the nature of the relationship between customer choice navigation and operational performance, Zhang et al. (2015) found that this capability has both direct and indirect relationship to performance as measured by financial performance metrics. Piller et al. (2014) however found that customer choice navigation capability only has second order relationship to operational performance. Conclusively, there is no agreement on the influence of choice navigation on operational performance and further research is needed on this area.

2.4 Research Gap

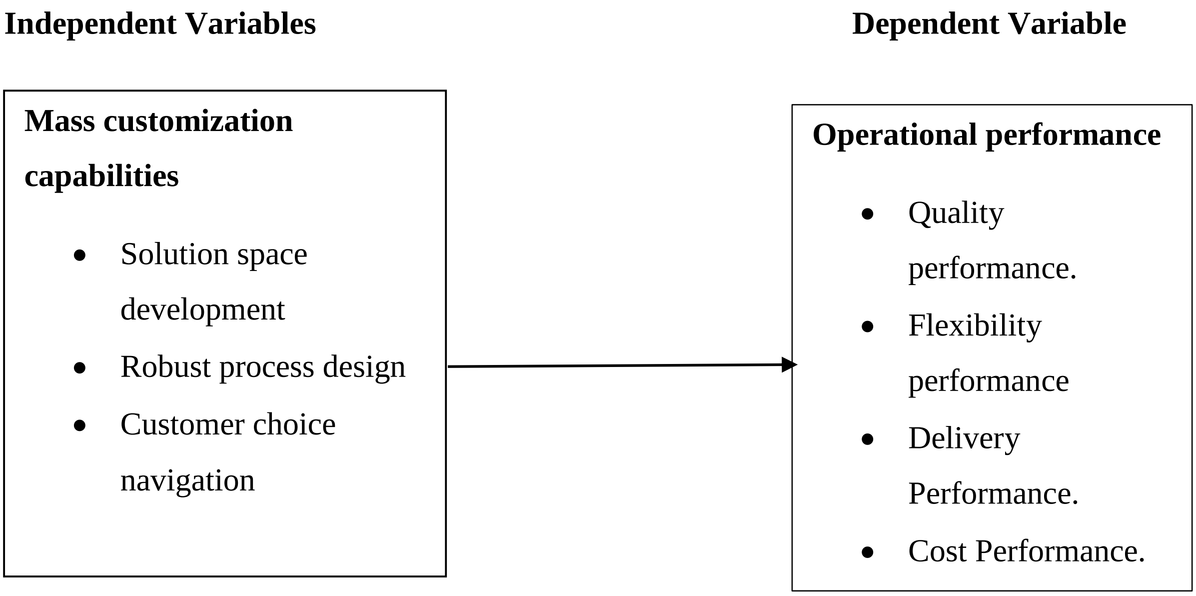
There are mixed empirical results on the relationship between mass customization capabilities and operational performance. Specifically, there are three schools of thought on the influence of mass customization capabilities on operational performance. One finds that mass customization capabilities have a significant positive influence on operational performance (Westbrook & Williamson, 1993; Kotha, 1995; Lau, 1995; Barman, 2002; Svensson & Barford, 2002; Wang, Wang & Zhao, 2015). Another that finds that mass customization capabilities only synergistically influence operational performance (Liu et al., 2012; Piller et al., 2014). The third school finds that mass customization capabilities are significant contributors of operational performance but lead to deteriorating operational performance (Worren, Moore & Cardona, 2002; Duray, 2002; Squire et al., 2006).

Conceptualization and measurement of mass customization capabilities and operational performance differs across studies and this could explain difference in findings across studies. According to Bourne et al. (2005) the context in terms of strategy, culture and resources could also explain differences in findings on this relationship between mass customization capabilities and operational performance. This research attempts to fill the research gap by providing empirical evidence on the influence mass customization capabilities on operational performance in a Kenyan manufacturing context.

2.5 Conceptual Framework

The conceptual framework below helps to explain the influence of mass customization capabilities on operational performance.

Figure 2.1: Conceptual framework



Source: Author (2017)

2.5.1 Operationalization

This subsection outlines how the researcher measured mass customization capabilities and operational firm performance.

Table 2.1: Operationalization of variables

Variable	Constructs	Operational definition	Measurement Scales	Source
Independent variable: Mass customization capabilities	Solution space development	This is the capability to evaluate the possible combinations of product options and attributes that customers may want to modify.	A likert scale of five was used with the following variables; 1-strongly disagree, 2-disagree, 3-somew agree, 4-agree & 5-strongly agree.	Tu et al., 2001; Piller et al., 2014
	Robust process design	This is the capability to reuse or re-combine existing organizational and value chain resources to fulfill differentiated customers' needs	A likert scale of five was used with the following variables; 1-strongly disagree, 2-disagree, 3-somew agree, 4-agree & 5-strongly agree.	Zhang et al., 2003; Piller et al., 2014
	Customer choice navigation	Capability to support customers in identifying their own problems and solutions, while minimizing complexity and burden of choice	A likert scale of five was used with the following variables; 1-strongly disagree, 2-disagree, 3-somew agree, 4-agree & 5-strongly agree.	Tu et al., 2001; Piller et al., 2014

Dependent variable: Operational firm performance	Quality performance	Viewed from perspectives such as conformance to specifications, durability of products, features, serviceability and aesthetics	A likert scale of five was used where; 1-strongly disagree, 2-disagree, 3-somew agree, 4-agree & 5-strongly agree.	Ward et al., 1996; Sandrin et al., 2014
	Flexibility performance	Viewed from perspectives such as; volume flexibility, mix flexibility, process flexibility and material handling flexibility and new product introduction speed	A likert scale of five was used where; 1-strongly disagree, 2-disagree, 3-somew agree, 4-agree & 5-strongly agree.	Anand & Ward, 2004
	Delivery performance	On time delivery performance and speed of delivery	A likert scale of five was used where; 1-strongly disagree, 2-disagree, 3-somew agree, 4-agree & 5-strongly agree.	Wang et al., 2015
	Cost performance	Cost performance measures the amount of resources used to produce a product and includes; manufacturing cost, running cost, service cost , value added and selling price	A likert scale of five was used where; 1-strongly disagree, 2-disagree, 3-somew agree, 4-agree & 5-strongly agree.	Wang et al., 2015

Source: Author (2017)

2.6 Chapter Summary

This chapter began by discussing three relevant theories for this study. The resource based view theory, capabilities based view and the cumulative model of competitive capabilities in manufacturing performance were discussed to explain the deployment of mass customization capabilities and the attainment of operational performance goals. The chapter included an empirical analysis where the following mass customization capabilities were discussed; solution space development, robust process design and customer choice navigation. Operational performance measures were also discussed and their relationship to mass customization capabilities. The research gap drawn from differences in empirical results and conceptualization of variables was highlighted. The chapter ended by presenting a conceptual framework in a diagrammatic form and providing a discussion on the operationalization of the variables under study.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter covers the research philosophy, design, population, data collection, data analysis, research quality and ethical considerations of this study.

3.2 Research Philosophy

This research adopted positivism research philosophy. This implies that the study assumed that only factual knowledge was trustworthy (Bajpai, 2011). Unlike social constructionism philosophical approaches that have provision for human interest and subjection, positivistic studies only require the researcher to collect factual data and interpret it (Crowther & Lancaster, 2008). Research findings generated from positivistic research are observable and statistically quantifiable (Wilson, 2014). Positivism approach relies on theory to develop hypothesis to be tested during the research process (Easterby, Thorpe & Jackson, 2008).

Quantitative research methods flow from the positivist theory and serve to test theory (Friedman, 1953). Highly structured studies, large samples and quantitative measurement characterize the positivism philosophy. This research adopted these characteristics of positivism to analyze the influence of mass customization capabilities on operational performance. This was in a bid to find out the relationship between the variables from in a deductive manner from existing theories.

3.3 Research Design

Survey research design was adopted since it enabled the researcher to draw a wide range of data for comparison purposes across multinational manufacturing firms. Survey methodology was applied whereby the researcher administered a standardized questionnaire to a large target population of multinational manufacturing firms in Kenya. A cross sectional study that focused on events in a snapshot of time was conducted. This was good for defining, profiling and examining associative relationships between the variables at a given time (Ahlstrom & Westbrook, 1999).

3.4 Population of the Study

The population for this study was multinational manufacturing firms in Kenya that were in the Kenya Association of Manufacturing database as of February 2017.

There were 93 multinational manufacturing firms in Kenya (KAM, 2017). A census of these firms was conducted since the population was not large.

3.5 Data Collection

The study used primary data collected from production plant heads in multinational manufacturing firms in Kenya. Production plant heads were the key informants for this study because they oversee the implementation of manufacturing capabilities that promise to improve performance. Primary data was used because of its originality. Quantitative data was collected by use of semi-structured questionnaires. Structured questions included a likert scale that was used to measure different aspects of the variables under study. Unstructured questions were included to provide the respondents with the freedom to capture any other important dimension of the variables that they felt was missing (Ahlstrom & Westbrook, 1999).

The researcher self- administered the questionnaires to firms within Nairobi which formed the bulk of the multinational manufacturing companies in Kenya (Were, 2016). The researcher mailed the rest of the questionnaires to the multinational manufacturing companies that were based outside Nairobi. Respondents were selected by job function, specifically targeting production plant managers.

The researcher facilitated the collection of data by first making phone calls to the respondents to seek their permission to participate in this study. Those who agreed to participate in the study were supplied with the questionnaires to fill and return to the researcher either via mail or physically when the researcher returned to collect them after two weeks. The researcher sent reminders to respondents who had not returned the filled questionnaires after every two weeks for a period of three months. Data was collected between the months of February and April, 2017 with 30th April as the cut off point for including any more responses into the data analysis.

3.6 Data Analysis

Data analysis involves the systematic application of statistical tools to process data into meaningful information (Lewis-Beck, 1995). After the data obtained from paper-based questionnaires was collected it was cleaned, coded and fed into google form sheets. Mailed questionnaires were sent via google forms so the responses did not have to be keyed in but only to be cleaned and coded. The researcher inspected the data for completeness and imported the data into the Statistical Package for the Social Sciences version 17.0 where descriptive statistics (mean, standard deviation, median), correlation analysis (Spearman’s rho) and multiple regression analysis were conducted in that order.

Descriptive analysis was used to analyze objective one which was about the extent of adoption of mass customization capabilities by multinational manufacturing firms in Kenya. Mean, standard deviation, median, maximum and minimum values were obtained for each mass customization capability studied. Firm profile data was also analyzed by use of descriptive statistics such as frequencies and percentages. Normally, descriptive statistics are conducted to provide simple summaries about a population or sample (Cooper & Schindler, 2014).

For objectives two, three and four Spearman's rho correlation analysis was conducted to determine whether there is a relationship between the dependent and the independent variables and the strength of the relationship if present. The correlation coefficient value from this analysis determined the measure of linear association between two variables where the coefficient should always be between -1 and +1 (Cooper & Schindler, 2014). A coefficient of -1 meant that variables are perfectly related in a negative linear sense, 0 meant that there is no relationship between the variables and +1 indicated that the variables are perfectly related in a positive linear sense (Cooper & Schindler, 2014).

After conducting a correlation analysis on objectives two, three, four and finding a relationship between variables, the next step was conducting multiple regression analysis. In this a model of relationship is hypothesized in the form $\Upsilon = \beta_0 + \beta_1 X + \varepsilon$ where β_0 and β_1 are model parameters and ε is a probabilistic error term that accounts for any variability in Υ that cannot be explained by the linear relationship with X (Cooper & Schindler, 2014).

The relationship between mass customization capabilities and operational performance was hypothesized using a multiple regression equation that contains the three mass customization capabilities namely solution space development, robust process design and customer choice navigation as independent variables regressed against operational performance as the dependent variable. The relationship between mass customization capabilities and operational performance was also hypothesized using individual regression equations relating each of the three mass customization capabilities and to operational performance in isolation. This was because organizations can have one capability at a time. These equations are shown below:

$\Upsilon = \beta_0 + \beta_1 SSD + \beta_2\ RPD + \beta_3\ CCN + \varepsilon$

$\Upsilon_1 = \beta_0 + \beta_1 SSD + \varepsilon$

$\Upsilon_2 = \beta_0 + \beta_2\ RPD + \varepsilon$

$\Upsilon_3 = \beta_0 + \beta_3$ CCN + ε

Where:

Y = the dependent variable which is a measure of operational performance for all three mass customization capabilities.

Y_1, Y_2, Y_3= dependent variables which are measures of operational performance for each mass customization capability.

SSD, RPD, CCN are initials for mass customization capabilities where SSD= solution space development, RPD= robust process design and CCN= customer choice navigation.

$\beta_1, \beta_2, \beta_3$ = coefficients for which we are trying to predict the value of ϒ.

β_0= constant.

ε = Error term.

3.6.1 Testing the Models

The following tests were performed and explained; correlation coefficient, coefficient of determination and F-test. Multicollinearity among the independent variables was tested using the variance inflation factor. These are explained below.

Correlation Coefficient (R)

This helped the researcher to determine the degree to which to variable movements were associated. Correlation coefficient is usually within range of values between -1 and 1 (Huber & Elvezio, 2009). A correlation of -1 indicates a perfect negative correlation while a correlation of 1 indicates a perfect positive correlation. One of 0 indicates no relationship. The closer the correlation coefficient is towards -1 or 1, the stronger the association between the variables (Huber & Elvezio, 2009).

Coefficient of Determination (R^2)

This enabled the researcher to explain how well the response variable variation was explained by the linear model. A models fits the data if the differences between the observed values and the model's predicted values are small and unbiased (Allen, 2004). R^2 ranges from 0 to 1. The closer the R^2 is to 1 the better the model fits the data.

F Test

F test was used to check if the regression model fits the population (Higgins, 2005). F-test compares a model with no predictors (intercept only model) with the specified model and is interpreted such that if the significance for the F value is less than 0.05 (for 95% confidence level), the model is significant, otherwise insignificant (Higgins, 2005).

Multi-collinearity

Multi-collinearity was tested using variance inflation factor (VIF) which quantifies how much variance is inflated. Variance of the estimated coefficients is inflated when multi-collinearity exists (Cater & Lee, 2001). A VIF of 5 or 10 and above indicates a multicollinearity problem (Cater & Lee, 2001).

3.7 Research Quality

Research quality was ascertained by ensuring its validity and reliability (Wang et al., 2015). External validity that relates to the data's ability to be generalized across settings and time was ensured by conducting a census so that the whole population took part in the study. Internal validity was achieved by tackling content and construct validity. Content reliability was confirmed from previous studies that have verified and used the measurement scales employed in this study (Flynn et al., 1999; Wang et al., 2015). Construct reliability was confirmed by use of Cronbach's alpha values that were used to check the reliability of the scales. Although the considerations for what makes a good Cronbach's coefficient are arbitrary and depend on the theoretical knowledge of the scale in question, many methodologists recommend a minimum coefficient of 0.65, coefficients that are less than 0.5 are usually unacceptable, especially for scales purporting to be uni-dimensional (Kistner & Muller, 2004; Wang et al., 2015).

Table 3.1: Cronbach's Alpha test

Reliability Statistics			
Variable	Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
SSD	.941	.942	5
RPD	.697	.778	5
CCN	.944	.945	5
Quality	.598	.661	5
Flexibility	.772	.796	5
Delivery	.847	.838	5
Cost	.792	.792	5

Source: Survey data (2017)

The table above shows that all items under study had a Cronbach's Alpha value that is greater than 0.5 hence they were all considered reliable.

3.7.1 Pilot Testing

Pilot testing was done to pre-test the data collection instrument in order to eliminate ambiguity and improve its relevance to the study objectives (De Vaus, 2014). A pilot study that involved nine multinational manufacturing companies in Kenya was conducted. This represented about 10% of the total population. Barringer and Meshoulam (2000) contend that a sample of 10% of the population is sufficient for use in a pilot study for social research. Random sampling was applied in selecting the nine manufacturing companies that participated in the pilot. Feedback from the pilot data collection and analysis helped to fine tune the questionnaire and also equipped the researcher with some experience in data collection that was useful in conducting the rest of the data collection. Pilot sample data was not included in the final data analysis.

3.8 Ethical Consideration

According to Shamoo and Resnick (2009) it is important to adhere to ethical norms in research because this promotes the aims of research such as knowledge and truth. To this end, this research was conducted in an honest and objective manner. The data collected for this study was used for academic purpose only. Respondent's confidentiality was maintained by ensuring they remained anonymous in the analysis and presentation of findings. There was no mention of respondent's names or specific reference to a company's information made in the analysis of findings.

Respondents participated in this research out of their own free will and the researcher did not cause physical harm, discomfort, pain or embarrassment to any respondent. The researcher ensured this by calling the respondents to obtain consent as pertains to participation in the study. Participant's rights and protections such as the right to withdraw from the data collection process without any ramifications were explained and adhered to during the study.

3.9 Chapter Summary

A discussion of the research philosophy, research design, data collection method, data analysis, quality of the study and ethical consideration was brought out in this chapter. Reliability test of the items under study was conducted and all mass customization capabilities and measures of operational performance were found to be reliable constructs with Cronbach's Alpha values above the recommended minimum value of 0.5.

CHAPTER FOUR

DATA ANALYSIS AND PRESENTATION

4.1 Introduction

This chapter presents the results obtained from different statistical analyses in order to answer the research questions. Descriptive statistics were used to explain preliminary information on the respondent firms' profile and the extent of adoption of mass customization capabilities. Correlation analysis was performed in order to find out if there was a relationship between each of the mass customization capabilities and operational performance. After a positive relationship was found, multiple regression analysis was conducted to examine the nature of this relationship. The data analyzed was collected using a questionnaire between the months of February and April 2017.

4.2 Response Rate

This research targeted heads of production department in multinationals that have a manufacturing plant in Kenya. Heads of production department were selected because they are responsible for authorizing and guiding employees in the implementation of manufacturing capabilities that have potential to improve performance. 56% of the targeted respondents of 93 multinational manufacturing firms responded to the questionnaire for this study.

4.3 Firm Profile

The number of countries where multinational firms have production plants, age of parent and subsidiary firms, size of multinationals in terms of number of employees and asset base, ownership structure and the decision making process were the firm profile variables that were collected and analyzed in this study. These are commonly used firm profile variables in mass customization studies (Piller et al., 2014; Su & Huang, 2016). Results on firm profile are shown in table 4.1 below.

Table 4.1: Firm profile

Characteristics	Options	Frequency	Percentage
No. of countries with production plants	1-50 countries	35	67.3%
	51-100 countries	6	11.5%
	101-150 countries	7	13.5%
	151-200 countries	3	5.8%
	Over 200 countries	1	1.9%
Age of firm in Kenya	1-5 years	1	1.9%
	5-10 years	4	7.7%
	10-15 years	5	9.6%
	15-20 years	5	9.6%
	Over 20 years	37	71.2%
Age of parent firm	5-10 years	1	1.9%
	15-20 years	4	7.7%
	More than 20 years	47	90.4%
Size in terms of number of employees	Less than 50 employees	1	1.9%
	51-100 employees	3	5.8%
	Over 100 employees	48	92.3%
Size in terms of asset base	101-500 million Ksh	1	1.9%
	Over 500 million Ksh	51	98.1%
Ownership structure	Foreign	33	63.5%
	Local	11	21.2%
	Both	8	15.4%
Type of decision making	Centralized	13	25%
	Decentralized	10	19.2%
	Both	29	55.8%

Source: Survey data (2017)

The results above show that majority of the respondents had production plants in 1-50 countries (67.3%), had been in Kenya for over 20 years (71.2%) and had parent firms that were over 20 years (90.4%). Majority of the respondents had over 100 employees (92.3%), had an asset base of over 500 million Kenya shillings (98.1%), were foreign owned (63.5%) and had combined centralized and decentralized decision making (55.8%).

4.4 Extent of Adoption of Mass Customization Capabilities by Multinational Manufacturing Firms in Kenya

Three mass customization capabilities which are considered to be of strategic importance (Helander & Jiao, 2002; Salvador et al., 2009; Piller et al., 2012) were used in this study. The respondents were asked to indicate the extent to which they agreed or disagreed to five statements per variable on each mass customization capability and measures of operational performance on a five point likert scale where 1 meant strongly disagree, 2 meant disagree, 3 meant somewhat agree, 4 meant agree and 5 meant strongly agree. Descriptive analysis was performed based on the responses for each question whereby the mean scores, standard deviations and overall mean scores of each variable were computed.

4.4.1 Solution Space Development Descriptive Statistics

With regards to solution space development capability the highest mean score was 4.3462 and the lowest was 4.1923. The overall mean score for solution space development was 4.2731 with a standard deviation of 1.00602. This implied that most multinational manufacturing firms had adopted solution space development capability and could therefore agree to most of the statements on this capability. This is shown below:

Table 4.2.1: Solution space development mean scores

Solution space development						
	N	**Mean**	**Std. Dev**	**Median**	**Minimum**	**Maximum**
1. Production of a wide variety of products for customers	52	4.35	.99	5.00	2.00	5.00
2. Development of routines to determine the optimal amount of variety.	52	4.35	.93	5.00	1.00	5.00
3. Identification of attributes along which customer preferences differ most	52	4.25	1.03	5.00	2.00	5.00
4. Monitoring changes in customer preferences for variety	52	4.23	1.04	4.00	2.00	4.00
5.Adapting product variety to changing customer requirements	52	4.19	1.05	5.00	1.00	5.00
Overall mean score		**4.27**	**1.01**			

Source: Survey data (2017)

4.4.2 Robust Process Design Descriptive Statistics

With regards to robust process design, the highest mean score was 4.5577 and the lowest was 3.1154. The overall mean score was 4.1269 with a standard deviation of 1.0573. This generally showed that the respondents either somehow agreed, agreed or strongly agreed to the statements on this capability and hence implied that robust process design had an intermediate adoption level as compared to the other two mass customization capabilities. This is shown in the table below:

Table 4.2.2: Robust process design mean scores

Robust process design						
	N	**Mean**	**Std. Dev**	**Median**	**Minimum**	**Maximum**
1. Operating profitably at different production levels	52	4.56	.73	5.00	2.00	5.00
2. Operating at different levels of output	52	4.42	.91	5.00	2.00	4.00
3. Changing from one product to another with ease	52	4.35	1.24	4.00	1.00	5.00
4. Varying the quantities of products produced	52	4.19	.87	5.00	1.00	5.00
5. Producing different products in the same plant.	52	3.12	1.53	3.00	1.00	4.00
Overall mean score		**4.13**	**1.06**			

Source: Survey data (2017)

4.4.3 Customer Choice Navigation Descriptive Statistics

With regards to customer choice navigation, the highest mean score was 3.1731 and the lowest was 2.6731. The overall mean score for this capability was 2.914 with a standard deviation of 1.3207. This meant that most respondents disagreed or somehow agreed to the statements on this capability and hence implied that customer choice navigation was not widely adopted compared with the other two mass customization capabilities. This is shown in the table below:

Table 4.2.3: Customer choice navigation mean scores

Customer choice navigation						
	N	**Mean**	**Std. Dev**	**Median**	**Minimum**	**Maximum**
1. Providing customer guidance and support throughout product configuration process	52	3.17	1.28	3.00	2.00	4.00
2. Enabling customers to find the optimal product configurations	52	2.98	1.34	2.00	2.00	3.00
3. Navigating customers through the customization process.	52	2.92	1.34	3.00	1.00	4.00
4. Providing customers with visualizations of product configurations	52	2.83	1.35	3.00	1.00	5.00
5. Composing products to customer's specific needs	52	2.67	1.29	3.00	1.00	3.00
Overall mean score		**2.92**	**1.32**			

Source: Survey data (2017)

The above findings are summarized below:

Table 4.2.4: Mean score rankings

	Mass customization capabilities	**Overall mean score**	**Standard deviation**
1.	Solution space development	4.27	1.01
2.	Robust process design	4.13	1.06
3.	Customer choice navigation	2.92	1.32

Source: Survey data (2017)

4.5 Influence of Mass Customization Capabilities on Operational Performance

This study aimed at assessing the influence of the following mass customization capabilities on operational firm performance; solution space development, robust process design and customer choice navigation. A correlation analysis followed by regression analyses was conducted.

4.5.1 Spearman's rho Correlation Analysis

Spearman's rho correlation analysis was done on each of the independent variables to determine if they are associated with the dependent variable and the strength of the monotonic relationship if present. The results are shown below:

Table 4.3: Spearman's rho correlation analysis results

Spearman's correlations						
			SSD	**RPD**	**CCN**	**Operational performance**
Spearman's rho	**SSD**	Correlation coefficient	1.000	.186	.464**	.254
		Sig. (2-tailed)		.186	.001	.069
		N	52	52	52	52
	RPD	Correlation coefficient	.186	1.000	.141	.547**
		Sig. (2-tailed)	.186		.317	.000
		N	52	52	52	52
	CCN	Correlation coefficient	.464**	.141	1	.370**
		Sig. (2-tailed)	.001	.317		.007
		N	52	52	52	52
	Operational performance	Correlation coefficient	.254	.547**	.370**	1
		Sig. (2-tailed)	.069	0	.007	
		N	52	52	52	52
****Correlation is significant at the 0.01 level (2-tailed)**						
***Correlation is significant at the 0.05 level (1-tailed)**						

Source: Survey data (2017)

In Table 4.3 above, correlation at the 0.01 level between variables is shown by two asterisks (**) while correlation at 0.05 level between variables is shown by one asterisk (*). Spearman's rank correlation was used to check if there was an association between each of the independent variables and the dependent variable. SSD in this output represents solution space development, RPD represents robust process design while CCN represents customer choice navigation.

Spearman's correlation coefficient (r_s) ranges from -1 to 1 and can be interpreted as follows. .00- .19 very weak, .20-.39 weak, .40-.59 moderate, .60-.79 strong and .80-1.0 very strong (Yue, Pillon & Cavadias, 2002). Based on the results in table above, solution space development has a weak positive monotonic relationship with operational performance r_s = .254. Robust process design has a moderate positive monotonic relationship with operational performance r_s= .547 and customer choice navigation has a weak positive monotonic relationship with operational performance r_s =.370.

In terms of significance of the relationship between each capability and operational performance, robust process design and customer choice navigation capabilities were significant at 95% confidence level. Solution space development was not significant at 95% confidence level but was significant at 90% confidence level. Regression analysis was conducted to ascertain this capability's influence on operational performance since 90% confidence was not negligible.

4.5.2 Multiple Regression Analysis

Operational performance was the dependent variable and the three mass customization capabilities namely solution space development, robust process design and customer choice navigation were the independent variables in this multiple regression. From the results of the coefficients output in table 4.4 below, the Beta values of the unstandardized coefficients were used to come up with the following regression equation:

Υ= 2.059 – 0.008SSD + 0.338RPD + 0.139CCN

Where:

2.059 = the value of operational performance when mass customization capability value is zero.

-0.008 = the coefficient of solution space development capability which means that for every unit increase in solution space development, we expect operational performance to decrease by 0.008 holding all other factors constant.

0.338 = the coefficient of robust process design capability which means that for every unit increase in robust process design, we expect operational performance to increase by 0.338 holding all other factors constant.

0.139 = the coefficient of customer choice navigation capability which means that for every unit increase in customer choice navigation, we expect operational performance to increase by 0.139 holding all other factors constant.

SSD= solution space development.

RPD= robust process design.

CCN= customer choice navigation.

Table 4.4: Mass customization capabilities and operational performance regression results

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.625[a]	.391	.353	.40242	1.935

Predicators: (Constant), CCN, RPD, SSD

ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	4.994	3	1.665	10.279	.000[b]
	Residual	7.773	48	.162		
	Total	12.767	51			

a. Dependent Variable: Operational performance
b. Predictors: (Constant), CCN, RPD, SSD

Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	2.059	.407		5.066	.000		
	SSD	-.008	.071	-.014	-.109	.913	.761	1.315
	RPD	.338	.077	.498	4.392	.000	.987	1.014
	CCN	.139	.054	.332	2.555	.014	.752	1.330

a. Dependent Variable: Operational performance

Source: Survey data (2017)

Table 4.4 above shows the results of the analysis of the influence of mass customization capabilities on operational performance. From the output at the first section of the table labelled model summary, we can pick out that R was 62.5% hence this was the amount of data explained in the model. R^2 explains the extent to which the independent variable explained the dependent variable. In this model, R^2 was 39.1% showing that 39.1% of the independent variables namely solution space development, robust process design and customer choice navigation explained the dependent variable, operational performance.

In the second section of the same table, we have the analysis of variance (ANOVA). This result was interpreted such that if the significance of the F value was less than 0.05 the model was significant, otherwise insignificant. In this case the significance of F was 0.000 which was less than 0.05 hence the model was significant.

The third section of the table contains the regression estimates including the significance levels and intercept. From this output, only robust process design and customer choice navigation capabilities were significant at 95% confidence level.

The third section of the output enabled us to check on multicollinearity whereby VIF should be <10 and not 5 if there is no multicollinearity. For all predictor variables namely, solution space development, robust process design and customer choice navigation, there was no multicollinearity.

4.5.2.1 Influence of Solution Space Development Capability on Operational Performance

From the multiple regression results in table 4.4 above, solution space development capability was not significant in explaining changes in operational performance (S= .913).The unstandardized coefficient of solution space development capability was -0.008 which means that for every unit increase in solution space development, we expect operational performance to decrease by 0.008 holding all other factors constant. The standardized coefficient value of this capability was -.014 which means that this is the unique effect that solution space development capability had on the dependent variable which was operational performance.

4.5.2.2 Influence of Robust Process Design on Operational Performance

From the multiple regression results in table 4.4, robust process design had a significant positive influence on operational performance (S=.000).The unstandardized coefficient of robust process design capability was 0.338 which means that for every unit increase in robust process design, we expect operational performance to increase by 0.338 holding all other factors constant. The standardized coefficient value of this capability was .498 which means that this was robust process design's unique contribution to explaining operational performance.

4.5.2.3 Influence of Customer Choice Navigation on Operational Performance

From the multiple regression results in table 4.4, customer choice navigation had a significant positive influence on operational performance (S=.014). The unstandardized coefficient of customer choice navigation capability was 0.139 which means that for every unit increase in customer choice navigation, we expect operational performance to increase by 0.139 holding all other factors constant. The standardized coefficient value of this capability was .332 which means that this was customer choice navigation's unique contribution to explaining operational performance.

4.5.3 Optimal Model after Removing the Insignificant Variable

Based on the multiple regression analysis above, robust process design and customer choice navigation capabilities were statistically significant at 95% confidence level while solution space development was not. This called for a further multiple regression analysis to determine the optimal model that could explain the synergetic influence of the mass customization capabilities on operational performance excluding the statistically insignificant variable.

From the results in table 4.5 below, the Beta values (β) of the unstandardized coefficients were used to come up with the following model:

$$\Upsilon = 2.034 + 0.338 \text{ RPD} + 0.136 \text{ CCN}$$

Where:

2.034 = the value of operational performance when mass customization capability value is zero.

0.338 = the coefficient of robust process design capability which means that for every unit increase in robust process design, we expect operational performance to increase by 0.338 holding all other factors constant.

0.136 = the coefficient of customer choice navigation capability which means that for every unit increase in customer choice navigation, we expect operational performance to increase by 0.136 holding all other factors constant.

RPD= robust process design.

CCN= customer choice navigation.

Table 4.5: Optimal model multiple regression results

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin -Watson
1	.625[a]	.391	.366	.39834	

Predicators: (constant), CCN, RPD

ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	4.992	2	2.496	15.730	.000[a]
	Residual	7.775	49	.159		
	Total	12.767	51			

a. Dependent variable: Operational performance
b. Predicators: (constant), CCN, RPD

Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	2.034	.330		6.156	.000		
	CCN	.136	.047	.325	2.895	.006	.987	1.013
	RPD	.338	.076	.498	4.439	.000	.987	1.013

a. Dependent variable: Operational performance

Source: Survey data (2017)

From Table 4.4.5 above, R was 62.5% which meant that this percentage of data was explained by this model. R^2 was 39.1% meaning that this is the percentage that the two independent variables namely robust process design and choice navigation capabilities influenced operational performance. This model was significant at 95% significance level as shown in the analysis of variance (ANOVA) section. Comparing this model with the previous one in table 4.4 we find that both models have identical R of 62.5% and R^2 of 39.1%.

From this model, robust process design had a significant positive influence on operational performance (S=.000). The standardized coefficient value of this capability was .498 which meant that this was the unique contribution of robust process design to operational performance. Customer choice navigation had a significant positive influence on operational performance (S=.006). The standardized coefficient of this capability was .325 which was the value of customer choice navigation unique contribution to operational performance.

4.6 Isolation Effects of each Mass Customization Capability

Simple regression analysis was done to determine each of the mass customization capabilities effect on operational performance. These was because the three mass customization capabilities are not adopted to the same extent by these multinational manufacturing firms hence it would be important to analyze each of the capability's influence on operational performance individually. Piller et al. (2014) contend that these capabilities should also be assessed in isolation especially for old firms that were not initially formed for the purpose of mass customization but have adopted the strategy gradually due to the growing customer need for customization. Resource constrains may also explain why firms may not have balanced the development of the three strategic mass customization capabilities (Thorsten et al., 2013). These regression analyses were done on SPSS version 17.0 and the results were as follows:

4.6.1 Isolated Influence of Solution Space Development Capability on Operational Performance

In this regression analysis solution space development was the independent variable while operational performance was the dependent variable. From the results in table 4.6.1 below, the Beta values (β) of the unstandardized coefficients were used to come up with the following model:

Υ_1= 3.413+ 0.094SSD

Where:

3.413= the value of operational performance when solution space development capability value is zero.

0.094= the coefficient of solution space development which means that for every unit increase in solution space development, we expect operational performance to increase by 0.094 holding all other factors constant.

SSD= solution space development

Table 4.6.1: Solution space development and operational performance regression result

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.170[a]	.029	.009	.49796

Predicators: (Constant), solution space development

ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.369	1	.369	1.488	.228[a]
	Residual	12.398	50	.248		
	Total	12.767	51			

a. Predicators: (constant), solution space development

b. Dependent variable: operational performance.

Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	3.413	.336		10.154	.000
	SSD	.094	.077	.170	1.220	.228

Dependent variable: Operational performance

Source: Survey data (2017)

Table 4.6.1 above shows the results of the analysis. The first section contains a table labeled model summary that provides the R value that explains how well the model describes the data. In this case the model explained 17% of the data. R^2 value explains the extent to which the independent variable explained the dependent variable. In this case 2.9% of solution space development explained operational performance. The adjusted R^2 value was 0.9% which means that this percentage of the total variability in the dependent variable was explained by the independent variable.

The table in the second section of the table contains the analysis of variance (ANOVA). This output brings out the F test statistics and the significance of the regression estimate. The F test compared a model with no predictors (intercept only model) with the specified model and it was interpreted such that if the significance for the F value was less than the significance level (0.05), the model was significant, otherwise insignificant. In this case the significance of the F value was .228 which was not less than .05 hence the model was not significant.

The last section of table 4.6.1 shows us the regression estimates including the significance levels. In this case, the constant was significant (S=.000) while solution space development (S=.228) was not significant at 95% confidence level.

4.6.2. Isolated Influence of Robust Process Design Capability on Operational Performance

In this regression analysis robust process design was the independent variable while operational performance was the dependent variable. From the results in table 4.6.2 below, the Beta values (β) of the unstandardized coefficients were used to come up with the following model:

Y_2= 3.764 + 0.158RPD

Where:

3.764 = the value of operational performance when robust process design capability value is zero.

0.158 = the coefficient of robust process design which means that for every unit increase in robust process design, we expect operational performance to increase by 0.158 holding all other factors constant.

RPD= robust process design.

Table 4.6.2: Robust process design and operational performance regression results

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.207[a]	.043	.024	.55533

Predicators: (Constant), Robust process design

ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.694	1	.694	2.249	.140[a]
	Residual	15.419	50	.308		
	Total	16.113	51			

a. Predicators: (Constant), Robust process design

b. Dependent variable: Operational performance

Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	3.764	.438		8.585	.000
	RPD	.158	.105	.207	1.500	.140

Dependent variable: Operational performance

Source: Survey data (2017)

Table 4.6.2 above shows the results of the analysis. In the first section of the table the model summary is displayed. The R value that explained how well the model described the data was 20.7%. The R^2 that explains the extent to which the independent variable explained the dependent variable is also displayed. The R^2 was provided as 4.3% meaning that this is the percentage to which robust process design explained operational performance. The adjusted R^2 was 2.4% meaning that this percentage of total variability of operational performance was explained by robust process design.

In the second section of table 4.6.2 we have the analysis of variance (ANOVA) results. This contains the F test statistic and the significance of the regression estimate. The F test compared an intercept only model with the specified model and it was interpreted such that if the significance for the F value was less than the significance level (0.05), the model was significant, otherwise insignificant. In this case the significance of the F value was .140 which is greater than .05 hence the model was not significant.

The last section of table 4.6.2 shows us the regression estimates including the significance levels. In this case, the constant is significant (S=.000) while robust process design (.140) is not significant at 95% confidence level.

4.6.3 Isolated Influence of Customer Choice Navigation Capability on Operational Performance

A regression analysis was also performed with customer choice navigation capability as the independent variable and operational performance as the dependent variable. From the results in table 4.6.3 below, the unstandardized Beta values (β) were used as coefficients to come up with the regression model for this relationship shown below:

$Ɣ_3$= 3.348 + 0.160CCN

Where:

3.348 = the value of operational performance when customer choice navigation capability value is zero.

0.160 = the coefficient of customer choice navigation capability which means that for every unit increase in customer choice navigation, we expect operational performance to increase by 0.160 holding all other factors constant.

CCN= customer choice navigation.

Table 4.6.3: Customer choice navigation and operational performance regression results

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.382[a]	.146	.129	.46695

Predicators: (Constant), customer choice navigation

ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1.865	1	1.865	8.554	.005[a]
	Residual	10.902	50	.218		
	Total	12.767	51			

a. Predicators: (Constant) Robust process design

b. Dependent variable: Operational performance

Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	3.348	.172		19.445	.000
	CCN	.160	.055	.382	2.925	.005

Dependent variable: Operational performance

Source: Survey data (2017)

The above table shows the results of the analysis. The first output on model summary shows that R= 38.2%. This was the percentage of the data that was explained by this model. R^2 was 14.6% and this showed that customer choice navigation capability explained 14.6% of the changes in operational performance. The adjusted R^2 was 12.9%. This meant that 12.9% of the total variability in operational performance was explained by customer choice navigation.

The second table is on the analysis of variance (ANOVA). This table was interpreted such that if the significance for the F value was less than the significance level (0.05), the regression model was significant otherwise insignificant. In this case the significance of the F value was 0.005 which was less than 0.05 hence the model was significant.

The third output table shows the regression estimates including the significance levels and intercept. Both the intercept (S=.000) and customer choice navigation capability (.005) were significant at the 95% significance levels because these values were less than 0.05.

4.7 Chapter Summary

This chapter explained how data was analyzed in order to meet the research objectives. The first objective was to examine the extent of adoption of mass customization capabilities by multinational manufacturing firms in Kenya. The means and standard deviations were computed and the results showed that solution space development was the most widely adopted followed by robust process design and finally customer choice navigation. The second objective was to assess the influence of solution space development on operational performance of multinational manufacturing firms in Kenya. Results showed that solution space development capability was not significant in explaining changes in operational performance both in isolation and synergistically in a multiple regression model.

The third objective was to establish the influence of robust process design on operational performance of multinational manufacturing firms in Kenya and the results showed that this capability had a significant positive influence on operational performance when assessed together with the other two mass customization capabilities in a multiple regression model. Robust process design in isolation was however not significant in explaining changes in operational performance. The last objective was to assess the influence of customer choice navigation on operational performance of multinational manufacturing firms in Kenya and the results indicated that this capability had a significant positive influence on operational performance in isolation and when assessed together with the other mass customization capabilities.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter summarizes and concludes the findings of this study. Managerial implications of these conclusions for multinational manufacturing firms are discussed. Limitations for this study are also discussed and complemented by suggestions for further research on this subject.

5.2 Discussion of the Findings

This section discusses the findings of the study under each study objective.

5.2.1 Extent of Adoption of Mass Customization Capabilities

From descriptive statistics, solution space development had the highest mean score, followed by robust process design and finally customer choice navigation. This showed that most firms were aware and agreed to most of the statements on solution space development followed by robust process design and finally customer choice navigation. This implied that most respondents had developed the initial capability for mass customization which is solution space development and hence had defined their envelop of variety along which they offer mass customization. The extent of adoption of robust process design was second meaning that less respondents had found a way to reconfigure standard modules in order to develop variety. Lastly, customer choice navigation was the least adopted capability meaning that less firms had the technological and/or human infrastructure to elicit customer needs and to allow customer-manufacturer co-design for mass customization.

The extent of adoption of mass customization capabilities by multinational manufacturing firms in Kenya shows that most firms have not balanced their implementation of mass customization capabilities. The initial capability of solution space development was what that had received most attention. This was attributable to the fact that multinational manufacturing firms studied were mostly mature firms that were not formed initially as mass customizers but had incorporated this manufacturing strategy so as not to lose out on the customers who want their heterogeneous needs satisfied (Thorsten et al., 2013). Piller et al. (2014) contends that initial standard good producers can benefit from mass customization by balancing their adoption of the three fundamental mass customization capabilities. Zhang et al. (2015) add that developing mass customization capabilities is costly whereas often there are resource constraints in firms that make them not able to implement mass customization capabilities at one go but continuously over time.

5.2.2 Influence of Solution Space Development on Operational Performance

This study findings indicated that solution space development individually was not significant in explaining changes in operational performance. This was consistent with the findings of Piller et al. (2014) who found solution space development not significant in explaining changes in nonfinancial performance in isolation. Non-financial performance however was measured using customer satisfaction and market growth. The study also found that solution space development was not statistically significant in explaining changes in operational performance even when aggregated with other mass customization capabilities in multiple regression analysis. This contradicted the findings of Thorsten et al. (2013) and those of Piller et al. (2014) which found that solution space development capability had a significant positive influence on firm performance when combined with the other strategic mass customization capabilities.

Differences in findings however could be explained by the age of firms studied whereby Thorsten et al. (2013) and Piller et al. (2014) studied start-up firms formed with the primary goal of being mass customizers. This study focused largely on mature firms over twenty years old that combine mass customization and mass production techniques. Firm performance was also measured differently whereby this study used operational performance measures of quality, delivery, flexibility and cost while the contradicting studies used market growth and customer satisfaction measures of non-financial performance.

5.2.3 Influence of Robust Process Design on Operational Performance

This study found that robust process design individually was not significant in explaining changes in operational performance. Robust process design however was significant in explaining changes in operational performance when all strategic mass customization capabilities were combined in a multiple regression analysis. This relationship was positive. This finding was consistent with previous findings whereby Piller et al. (2014) and Thorsten et al. (2013) in their study of the influence of strategic mass customization capabilities on performance as measured by customer satisfaction and market growth, found robust process design alone not significant in explaining changes in performance but synergistically significant in a positive sense. This means that developing robust process design capability in isolation may not significantly contribute to operational performance. The presence of other capabilities strengthen this relationship between robust process design and operational performance.

This finding however contradicted with that of Zhang et al. (2015) who found that robust process design was significant in explaining changes in firm performance both individually and when summed up with the other two mass customization capabilities namely; solution space development and customer choice navigation. Differences in finding may be attributable to the fact that Zhang et al. (2015) used measures of financial performance and included other mass customization capabilities that are not classified as of strategic importance for instance integrated logistics capability.

5.2.4 Influence of Customer Choice Navigation on Operational Performance

This study found that customer choice navigation had a significant positive influence on operational performance both individually and synergistically when combined with the other mass customization capabilities. This findings were supported by those of Zhang et al. (2015) who found that customer choice navigation capability had a significant positive influence on performance both individually and in synergy with the other two mass customization capabilities of strategic importance.

This finding however contradicts existent literature such as that of Piller et al. (2014) who found customer choice navigation capability alone not significant in explain changes in non-financial performance among E-commerce companies. The findings of Thorsten et al. (2013) which are in the context of start-up manufacturing firms were also contradicted.

This implies that developing customer choice navigation capability helps to improve operational performance for mature manufacturing firms. This also emphasizes the importance of this capability for mature mass customization manufacturing firms.

5.3 Conclusions

According to this study, solution space development and robust process design individually do not have a significant influence on operational performance. Customer choice navigation in isolation however had a significant positive influence on operational performance. Looking at the combined influence of mass customization capabilities on operational performance, robust process design and customer choice navigation capabilities were significant in explaining changes in operational performance. This model has a significance of 0.000. In terms of the extent to which the mass customization capabilities influenced operational performance, the coefficient of determination was 39.1%.

These findings are consistent with those of Franke and Schreier (2010), Liu, Shah and Schroeder (2012) and Piller et al. (2014) who found that the influence of mass customization capabilities on operational performance to a large extent depends on synergy between the three strategic mass customization capabilities. Further to this, Milgrom and Robert (1995) explain that the magnitude of the effect of the three mass customization capabilities is greater than the summation of the marginal effects obtained from building each strategic mass customization capability in isolation. This implies that firms that are able to implement all the three mass customization capabilities namely solution space development, robust process design and customer choice navigation simultaneously are likely to improve their operational performance.

5.4 Recommendations

Recommendations for multinational manufacturing firms' managers can be derived from this study. First, these managers could understand the three strategic mass customization capabilities and their measurement dimensions. This will help managers to develop standard measurement tools for these capabilities to facilitate comparison and benchmarking (Su & Huang, 2016).

Secondly, this study confirmed that mass customization capabilities have a significant positive impact on operational performance. Mass customization capabilities explain 39.1% of the changes in operational performance. This therefore means that it is not futile for manufacturing firms' managers to implement mass customization manufacturing capabilities (Piller et al., 2014).

Thirdly, managers of manufacturing firms will appreciate the complementary nature of mass customization capabilities in explaining changes in operational performance. This implies that production plant managers should balance the investment on all three mass customization capabilities if they want to succeed in mass customization manufacturing efforts (Milgrom & Robert, 1995).

Finally, this research contributes to existing literature by attempting to expound on the influence of mass customization capabilities on operational performance in the Kenyan context. This current contribution to the body of knowledge on this area should provide a basis for further research by other interested scholars.

5.5 Limitations of the Study

This study was not without limitation. First, this research only focused on three mass customization capabilities that are considered to be of strategic importance. Other mass customization capabilities could also be studied to find out their influence on operational performance.

This study also limited operational performance measurement to four commonly used metrics namely cost, quality, flexibility and delivery performance. Other measures of performance including financial and non-financial measures could also be used to find out their relationship to mass customization capabilities.

5.6 Suggestions for Future Research

This study recommends further investigations on the influence of mass customization capabilities on operational performance in other industries and contexts other than manufacturing and Kenya respectively. This is because such contextual factors may influence the narrative around mass customization capabilities implementation and operational performance measures.

Future research may also include organizational factors as moderating factors in the relationship between mass customization capabilities and operational performance. This research only focused on documenting the influence of mass customization capabilities on operational performance of multinational manufacturing firms in the Kenyan context which to the best of the researcher’s knowledge could not be found from relevant journals and search engines such as Google scholar.

Finally, this study recommends future studies to conduct longitudinal studies on this subject because operational performance is a dynamic variable that changes over time. Developing mass customization capabilities is also a continuous process hence there is need for periodic analyses.

REFERENCES

Adegbesan, J. A. (2009). On the origins of competitive advantage: Strategic factor markets and heterogeneous resource complementarity. *Academy of Management Review*, *34*(3), 463-475.

African Development Bank. (2014). High growth despite regional and global adversity. *Annual Report*.

African Development Bank. (2016). Development forum (Marrakech) Africa Research Bulletin: *Economic, Financial and Technical Series*, 51(10), 20600C-20601C.

Agrawal, M., Kumaresh, T., Mercer, & Glenn, A. (2001). The False promise of Mass Customization. *McKinsey Quartery*, 62-62.

Ahlstrom, P., & Westbrook, R. (1999). Implications of mass customization for operations management. *International Journal of Operations & Production Management*, 19(3), 262-275.

Allen, M. (2004). Understanding Pregression Analysis. New York: Plenum Press.

Alptekinoglu, A., & Corbett, C.J. (2008). Mass customization versus mass production: Variety and price competition. *Manufacturing and Service Operations Management*, 10 (2), 204-217.

Amit, R., & Schoemaker, P. (1993). Strategic assets and organizational rent. *Strategic Management Journal*, *14*(1), 33-46.

Anand, G., & Ward, P. (2004). Fit, Flexibility and Performance in manufacturing: Coping with dynamic environments. *Productions and Operations Management Journal*, *13*(4), 369-385.

Anderson, D. M. (2004). Build-to-Order & Mass Customization: the ultimate supply chain management and lean manufacturing strategy for low-cost on-demand production without forecasts or inventory. CIM Press.

Ayuma, R. (2011). Mass customization as a business strategy for five star hotels in Nairobi. Kenyatta University Repository.

Badurdeen, F., & Masel, D. (2007). A modular minicell configuration for mass customisation manufacturing. *International Journal of Mass Customisation*, *2*(1-2), 39-56.

Bajpai, N. (2011). *Business research methods*. Pearson Education India.

Bamberger, P., & Meshoulam, H. (2000). Human Resource Strategy: Formulation, Implementation and Impact. *Sage*: Beverly Hill.

Barney, J. B. (1986). Organizational culture: can it be a source of sustained competitive advantage?. *Academy of management review*, *11*(3), 656-665.

Barney, J.B. (1991). Firm resources and sustained competitive advantage. *Journal of management*, *17*(1), 99-120.

Bartels, F. L., Buckey, P., & Mariano, G. (2009). *Multinational Enterprises' Foreign Direct Investment Location Decisions Within the Global Factory*. United Nations Industrial Development Organization.

Berger, C., Möslein, K., Piller, F., & Reichwald, R. (2005). Co-designing modes of cooperation at the customer interface: learning from exploratory research. *European Management Review*, *2*(1), 70-87.

Berman, B. (2002). Should your firm adopt a mass customization strategy? *Business Horizons*, *45*(4), 51-60.

Berry, W. L., & Cooper, M. C. (1999). Manufacturing flexibility: methods for measuring the impact of product variety on performance in process industries. *Journal of Operations Management*, *17*(2), 163-178.

Bhatia, A., & Asai, R. (2015). Mass customization in apparel & footwear industry- Today's strategy, future's necessity. Wipro: White paper.

Blecker, T., & Abdelkafi, N. (2007). The development of a component commonality metric for mass customization. *IEEE Transactions on Engineering Management*, *54*(1), 70-85.

Blecker, T., & Friedrich, G. (2007). Guest editorial: Mass customization manufacturing systems. *IEEE Transactions on Engineering Management*, *54*(1), 4-11.

Blecker, T., Friedrich, G., Kaluza, B., Abdelkafi, N., & Kreutler, G. (2005). *Information and management systems for product customization* (Vol. 7). Springer Science & Business Media.

Bourne, M., Kennerley, M., & Franco-Santos, M. (2005). Managing through measures: a study of impact on performance. *Journal of manufacturing technology management*, *16*(4), 373-395.

Broekhuizen, T. L. J., & Alsem, K. J. (2002). Success factors for mass customization: a conceptual model. *Journal of Market-Focused Management*, *5*(4), 309-330.

Busi, M., & Bititci, U. S. (2006). Collaborative performance management: present gaps and future research. *International Journal of Productivity and Performance Management*, *55*(1), 7-25.

Campbell, J. P. (1977). On the nature of organizational effectiveness. *New perspectives on organizational effectiveness*, *13*, 55.

Carter, H., & Lee C. (2001). Collinearity. *A companion to theoretical econometrics*, 257-78.

Cater, T. (2004). Capability-Based School of Thought's Relevance on Firms' Competitive Advantage Sources. *Zagreb International Review of Economics and Business*, *7*(1), 39-59.

Cocacolasabco,com (2017). Retrieved on 25th January, 2017.

Collins, R. S., & Schmenner, R. (1993). Factory Focus for the 1990s. *European management journal*, *11*(4).

Conner, K. R. (1991). A historical comparison of resource-based theory and five schools of thought within industrial organization economics: do we have a new theory of the firm? *Journal of management*, *17*(1), 121-154.

Connolly, T., Conlon, E. J., & Deutsch, S. J. (1980). Organizational effectiveness: A multiple-constituency approach. *Academy of Management Review*, *5*(2), 211-218.

Cooper, D., & Schindler, P. (2014). Business Research Methods. McGraw-Hill: Irwin.

Corbett, C., & Van Wassenhove, L. (1993). Trade-offs? What trade-offs? Competence and competitiveness in manufacturing strategy. *California management review*, *35*(4), 107-122.

Crowther, D., & Lancaster, G. (2008). Research Methods: a Consice Introduction to Research in Management and Business Consultancy.

Cruz-Ros, I., Scapens, R. W., & Major, M. (2011). The localisation of a global management control system. *Accounting, Organizations and Society*, *36*(7), 412-427.

Davis, S. M. (1987). Future Perfect: A Startling Vision of the Future We Should Be Managing Now. *Reading, MA: Addison Wesley*.

De Vaus, D. (2013). *Surveys in social research*. Routledge.

Dellaert, B. G., & Dabholkar, P. A. (2009). Increasing the attractiveness of mass customization: The role of complementary on-line services and range of options. *International Journal of Electronic Commerce*, *13*(3), 43-70.

Dtdobie.co.ke (2017). Retrieved on 24th January, 2017.

Duray, R. (2002). Mass customization origins: mass or custom manufacturing?. *International Journal of Operations & Production Management*, *22*(3), 314-328.

Easterby, M., Thorpe, R., Jackson, P., & Lowe, A. (2008). Management research: theory and practice. *Sage Publications Ltd., London, UK*, *101*, 210.

Eisenhardt, K. M., & Martin, J. A. (2000). Dynamic capabilities: what are they?. *Strategic management journal*, 1105-1121.

Ethiraj, S. K., Kale, P., Krishnan, M. S., & Singh, J. V. (2005). Where do capabilities come from and how do they matter? A study in the software services industry. *Strategic management journal*, *26*(1), 25-45.

Fahy, J., Hooley, G., Cox, T., Beracs, J., Fonfara, K., & Snoj, B. (2000). The development and impact of marketing capabilities in Central Europe. *Journal of international business studies*, *31*(1), 63-81.

Farole, T., & Winkler, D. (Eds.). (2014). *Making foreign direct investment work for Sub-Saharan Africa: local spillovers and competitiveness in global value chains*. World Bank Publications.

Ferdows, K., & De Meyer, A. (1990). Lasting improvements in manufacturing performance: in search of a new theory. *Journal of Operations management*, *9*(2), 168-184.

Flynn, B. B., & Flynn, E. J. (2004). An exploratory study of the nature of cumulative capabilities. *Journal of Operations Management*, *22*(5), 439-457.

Flynn, B. B., Schroeder, R. G., & Flynn, E. J. (1999). World class manufacturing: an investigation of Hayes and Wheelwright's foundation. *Journal of operations management*, *17*(3), 249-269.

Foss, N. J. (1998). The resource-based perspective: an assessment and diagnosis of problems. *Scandinavian Journal of management*, *14*(3), 133-149.

Franke, N., & Piller, F. T. (2003). Key research issues in user interaction with user toolkits in a mass customisation system. *International Journal of Technology Management*, *26*(5-6), 578-599.

Franke, N., & Piller, F. (2004). Toolkits for user innovation and design: An exploration of user interaction and value creation. *Journal of Product Innovation management*, 21 (6), 401-415.

Franke, N., & Schreier, M. (2010). Why customers value self-designed products: The importance of process effort and enjoyment. *Journal of Product Innovation Management*, *27*(7), 1020-1031.

Friedman, M. (1953). *Essays in positive economics*. University of Chicago Press.

Gensheng, L., Rachna, S. & Roger, S. (2012). The relationships among functional integration, mass customisation, and firm performance. *International Journal of Production Research*, *50*(3), 677-690.

Ginsberg, A., & Venkatraman, N. (1985). Contingency perspectives of organizational strategy: a critical review of the empirical research. *Academy of management review*, *10*(3), 421-434.

Godart, O. N., & Görg, H. (2013). Suppliers of multinationals and the forced linkage effect: Evidence from firm level data. *Journal of Economic Behavior & Organization*, *94*, 393-404.

Goodman, P. S., & Pennings, J. M. (1977). *New perspectives on organizational effectiveness* (pp. 1-12). San Francisco: Jossey-Bass.

Görg, H., & Seric, A. (2016). Linkages with multinationals and domestic firm performance: The role of assistance for local firms. *The European Journal of Development Research*, *28*(4), 605-624.

Gownder, J. P., Rotman Epps, S., Corbett, A. E., Doty, C. A., Schadler, T., & McQuivey, J. L. (2011). Mass customization is (finally) the future of products. *Forrester Report*.

Gracia, B., & Winkelhues, K. (2016). The Next Revolution in Mass Customization: An insight into the sneaker market. *International Journal of Marketing, Communication and New Media*, *4*(6).

Hallgren, M. (2007). Manufacturing Strategy, Capabilities and Performance. *Linkoping Studies in Science and Technology, Doctoral Dissertations*, No. 1108.

Hart, C. W. (1995). Mass customization: conceptual underpinnings, opportunities and limits. *International Journal of Service Industry Management*, *6*(2), 36-45.

Harzer, A. (2013). Success factors in crowd funding. University publishing house Ilmenau.

Helander, M., & Jiao, J. (2002). Research on E-product development for mass customization. *Technovation*, 22 (11), 717-724.

Helfat, C. E., & Peteraf, M. A. (2003). The dynamic resource-based view: Capability lifecycles. *Strategic management journal*, *24*(10), 997-1010.

Higgins, J. (2005). An Introduction to Modern Nonparametric Statistics. CA: Brooks/ Cole.

Hoek, R. V. (2001). The rediscovery of postponement a literature review and directions for research. *Journal of Operations Management*, 19(2), 161-184.

Hofer, C. W. (1983). ROVA: A new measure for assessing organizational performance. *Advances in strategic management*, *2*, 43-55.

Honeycutt, E., & Harper, S. (1993). The impact of flexible manufacturing on competitive strategy. *Industrial Management*, 35 (6), 2-15.

Hooley, G., Fahy, J., Cox, T., Beracs, J., Fonfara, K., & Snoj, B. (1999). Marketing capabilities and firm performance: a hierarchical model. *Journal of market-focused management*, *4*(3), 259-278.

Hoopes, D. G., & Madsen, T. L. (2008). A capability-based view of competitive heterogeneity. *Industrial and Corporate Change*, *17*(3), 393-426.

Howe, N., & Strauss, W. (2000). Millennials rising: The next great generation. New York: Vintage.

Huber, P., & Elvezio, R. (2009). *Robust Statistics* (2 ed.). New York: Wiley- Blackwell.

Huffman, C., & Kahn, B. E. (1998). Variety for sale: Mass customization or mass confusion?. *Journal of retailing*, *74*(4), 491-513.

Hvam, L., Mortensen, N. H., & Riis, J. (2008). *Product customization*. Springer Science & Business Media.

Jack, E. P., & Raturi, A. (2002). Sources of volume flexibility and their impact on performance. *Journal of operations management*, *20*(5), 519-548.

Kamau, S. (2016). Performance measurement practices and operational performance of manufacturing firms in Kenya. *University of Nairobi Library Repository*: Nairobi

Kaplan, R.S., & Norton, D.P. (2001) Transforming the balanced scorecard from performance measurement to strategic management: Part I, *Accounting Horizons*, 15(1), 87-104.

Kenya Association of Manufacturers (2017). Retrieved from www.kam.com on 26th Jan 2017.

Kenya Bureau of Statistics Economic survey (2016) Retrieved from knbs.or.ke on 27th Jan 2017.

Kenya Investment Authority (2017). Retrieved from www.keninvest.com on 26th Jan 2017.

Ketokivi, M., & Schroeder, R. (2004). Manufacturing practices, strategic fit and performance. *International Journal of Operations & Production Management*, 24(2), 171-191.

Kokko, A., & T.T. Thang (2014). Foreign Direct Investment and the Survival of Domestic Private Firms in Viet Nam. *Asian Development Review*, 31, 53-91.

Khouja, M. (1997). The scheduling of economic lot sizes on volume flexible production systems. *International Journal of Production Economics, 48*(1), 73-86.

Kistner, E. O., & Muller, K. E. (2004). Exact distributions of intra-class correlation and Cronbach's alpha with Gaussian data and general covariance. *Psychometrika*, *69*, 459-474.

Kotha, S. (1995). Mass customization: implementing the emerging paradigm for competitive advantage. *Strategic Management Journal*, *16*(S1), 21-42.

Kristal, M. M., Huang, X., & Schroeder, R. G. (2010). The effect of quality management on mass customization capability. *International Journal of Operations & Production Management*, 30(9), 900-922.

Kumar, A. (2005). Mass Customization: Metrics and Modularity. *The International Journal of Flexible Manufacturing Systems*, 16, 287-311.

Lai, F., Zhang, M., Lee, D. M., & Zhao, X. (2012). The Impact of Supply Chain Integration on Mass Customization Capability: An Extended Resource-Based View. *IEEE Transactions on Engineering Management*, 59(3), 443-456.

Lau, S. (1995). Mass Customization: The next industrial revolution. *Industrial Management*, 37 (5), 18-19.

Leong, G., Snyder, D., & Ward, P. (1990). Research in the process and content of manufacturing strategy. *International Journal of Management Science*, 18 (2), 109-122.

Lewis-Beck, M. (1995). *Data analysis: An introduction* (No. 103). Sage.

Li, S., & Tirupati, D. (1997). Impact of product mix flexibility and allocation policies on technology. *Computers & operations research*, *24*(7), 611-626.

Lippman, S. A., & Rumelt, R. P. (2003). A bargaining perspective on resource advantage. *Strategic Management Journal*, *24*(11), 1069-1086.

Liu, G., Shah, R., & Schroeder, R. (2012). The relationships among functional integration, mass customization and firm performance. *International Journal of Production Research*, 50 (3), 67-690.

Liu, G. J., Shah, R., & Schroeder, R. G. (2006). Linking work design to mass customization: a sociotechnical systems perspective. *Decision Sciences*, *37*(4), 519-545.

Makadok, R. (2001). Toward a synthesis of the resource-based and dynamic-capability views of rent creation. *Strategic management journal*, *22*(5), 387-401.

March, J. G., & Sutton, R. I. (1997). Crossroads—organizational performance as a dependent variable. *Organization science*, *8*(6), 698-706.

McCarthy, I.P., (2004). Special issue editorial: the what, why and how of mass customization. *Production Planning & Control*, 15 (4), 347-351.

Milgrom, P., & Roberts, J. (1995). Complementarities and fit strategy, structure, and organizational change in manufacturing. *Journal of accounting and economics*, *19*(2), 179-208.

Moore, M., & Fairhurst, A. (2003). Marketing capabilities and firm performance in fashion retailing. *Journal of Fashion Marketing and Management: An International Journal*, *7*(4), 386-397.

Nakane, J. (1986). Manufacturing Futures Survey in Japan. Waseda University. *System Science Institute, Tokyo*.

Nielsen, K., & Brunoe, T. (2014). Mass customization assessment and measurement framework. In M.F. Zaeh (Ed.), enabling manufacturing competitiveness and economic sustainability, proceedings of the 5th International Conference on changeable, agile, reconfigurable and virtual production. *Springer*, 165-170.

Nielsen, K., Brunoe, D., & Storberg, H. (2013). Choice navigation assessment for mass customization. *Proceedings of the 15th International Configuration Workshop*, 13-19.

Nthiiga, M. (2015). Role of competition in determining choice of strategic response of multinational corporations in Kenya. *Jomo Kenyatta University Library Repository*: Nairobi.

Peteraf, M. (1993). The corner stones of competitive advantage: A resource-based view. *Strategic Management Journal*, 14 (3), 179-191.

Peteraf, M., & Barney, J. (2003). Unraveling the resource-based tangle. *Journal of Management*, 36 (1), 349-372.

Peteraf, M., & Bergen, M. (2003). Competitor identification and competitor analysis: A broad based managerial approach. *Managerial and Decision Economics Journal*, 23, 157-169.

Piller, F. T., & Müller, M. (2004). A new marketing approach to mass customisation. *International Journal of Computer Integrated Manufacturing*, *17*(7), 583-593.

Piller, F. (2003). Mass Customization. *Wiesbaden : Gabler (3)* .

Piller, F. (2016). Keynote and executive talks. Aachen University.

Piller, F., & Ihl, C. (2002). Strategy-Business Intelligence-Mass Customization ohne Mythos. *New Management-Zurich*, *71*(10), 16-31.

Piller, F. T., Moeslein, K., & Stotko, C. M. (2004). Does mass customization pay? An economic approach to evaluate customer integration. *Production planning & control*, *15*(4), 435-444.

Piller, F. T., & Stotko, C. M. (2003). Mass Customization and Customer Integration: New Ways to the Innovative Product. (Symposium).

Piller, F., Diener, K., & Luttgens D. (2015). Cost of collaboration in open innovation: The mediating role of search strategy.

Piller, F., Harzer, T., Ihl, C., & Salvador, F. (2014, January). Strategic capabilities of mass customization based e-commerce: Construct development and empirical test. In *System Sciences (HICSS), 2014 47th Hawaii International Conference on* (pp. 3255-3264). IEEE.

Piller, F. T., Lindgens, E., & Steiner, F. (2012). Mass Customization at Adidas: Three Strategic Capabilities to Implement Mass Customization.

Piller, F., Salvador, F., & Walcher, D. (2012). Overcoming the Challenge of Implementing Mass Customization.

Piller, F.T. (2006). Mass Customization: A competitive strategy concept in the information age (4th ed.). Wiesbaden: Springer-Gabler.

Piller, F. T., & Tseng, M. M. (2010). Handbook of Research in Mass Customization & Personalization, Vol. 1, Strategies and Concepts. *New Jersey, London, Singapore, Beijing,-Shanghai, Hong Kong, Taipei, Cennai: World Scientific Publishing Co. Pte. Ltd*.

Pine, B. (2009). Mass customization: Combining elements of mass production with those of bespoke tailoring.

Pine, B. J., Peppers, D., & Rogers, M. (1995). *Do you want to keep your customers forever?*. Harvard Business Press.

Pine, B. J. (1993). *Mass customization: the new frontier in business competition*. Harvard Business Press.

Poulin, M., Montreuil, B., & Martel, A. (2006). Implications of personalization offers on demand and supply network design: A case from the golf club industry. *European Journal of Operational Research*, *169*(3), 996-1009.

Prahalad, C., & Hamel, G. (1990). The core competence of the corporation. *Harvard Business Review*, 68 (3), 79-91.

Priem, R. L., & Butler, J. E. (2001). Tautology in the resource-based view and the implications of externally determined resource value: Further comments. *Academy of Management review*, *26*(1), 57-66.

Rautenstrauch, C., Tangermann, H., & Turowski, K. (2002). Manufacturing planning and control content management in virtual enterprises pursuing mass customization. In *Moving into Mass Customization* (pp. 103-118). Springer Berlin Heidelberg.

Ray, G., Barney, J. B., & Muhanna, W. A. (2004). Capabilities, business processes, and competitive advantage: choosing the dependent variable in empirical tests of the resource-based view. *Strategic management journal*, *25*(1), 23-37.

Richardson, G. B. (1972). The organisation of industry. *The economic journal*, *82*(327), 883-896.

Ros, S.C., Cruz, T.F., & Cabanero, C.P. (2010). Marketing capabilities, stakeholders' satisfaction, and performance. *Service Business*, *4*(3-4), 209-223.

Roth, A. V. (1996). Achieving strategic agility through economies of knowledge. *Planning Review*, *24*(2), 30-36.

Roth, A. V., & Miller, J. G. (1992). Success factors in manufacturing. *Business Horizons*, *35*(4), 73-81.

Salvador, F., & Piller, F. (2013). Design toolkits, organizational capabilities, and firm performance. *Revolutionizing Innovation: Users, Communities, and Open Innovation, MIT Press, Cambridge, MA.*

Salvador, F., De Holan, P. M., & Piller, F. T. (2009). Cracking the code of mass customization. *MIT Sloan Management Review*, *50*(3), 71.

Salvador, F., Rungtusanatham, M., & Forza, C. (2004). Supply-chain configurations for mass customization. *Production Planning & Control*, *15*(4), 381-397.

Sandrin, E., Trentin, A., & Forza, C. (2014). Organizing for mass customization: literature review and research agenda. *International Journal of Industrial Engineering and Management*, *5*(4), 159-167.

Shamoo, A. E., & Resnik, D. B. (2009). *Responsible conduct of research*. Oxford University Press.

Slater, S. F., & Narver, J. C. (2000). The positive effect of a market orientation on business profitability: A balanced replication. *Journal of business research*, *48*(1), 69-73.

Smart, D. T., & Conant, J. S. (1994). Entrepreneurial orientation, distinctive marketing competencies and organizational performance. *Journal of applied business research, 10*(3), 28.

Spring, M., & Dairyample, J. (2000). Product customization and manufacturing strategy, *International Journal of Operations & Production Management*, 20 (4), 441 - 467

Squire, B., Brown, S., Readman, J., & Bessant, J. (2006). The impact of mass customization on manufacturing trade-offs. *Production and operations Management Journal*, 15, (1), 10-21.

Stalk, G., Evans, P., & Shulman, L. (1992). Competing on capabilities: The new rules of corporate strategy, *Harvard Business Review*, 70 (4), 57-69.

Su, J., Chang, Y., & Ferguson, M. (2005). Evaluation of Postponement Structures to Accommodate Mass Customization. *Journal of Operations Management*, 23, 305-318

Su, S., & Huang, Y. (2016). Customized Marketing: An approach for SMEs to improve customer satisfaction.

Subramaniam, M., & Venkatraman, N. (2001). Determinants of transnational new product development capability: Testing the influence of transferring and deploying tacit overseas knowledge. *Strategic Management Journal*, *22*(4), 359-378.

Svensson, C., & Barfod, A. (2002). Limits and opportunities in mass customization for “build to order” SMEs. *Computers in industry*, *49*(1), 77-89.

Teece, D. J., Pisano, G., & Shuen, A. (1997). Dynamic capabilities and strategic management. *Strategic management journal*, 509-533.

Thorsten, Simon and Harzer (2013). Value Creation through Mass Customization: An empirical analysis of the requisite strategic capabilities. Research Dissertation.

Trentin, A., Forza, C., & Perin, E. (2012). Organisation design strategies for mass customisation: an information-processing-view perspective. *International Journal of Production Research*, *50*(14), 3860-3877.

Tsai, M. T., & Shih, C. M. (2004). The impact of marketing knowledge among managers on marketing capabilities and business performance. *International journal of management*, *21*(4), 524.

Tseng, M. M., & Jiao, J. (2001). Handbook of Industrial Engineering, Technology and Operation Management.

Tu, Q., Vonderembse, M. A., & Ragu-Nathan, T. S. (2001). The impact of time-based manufacturing practices on mass customization and value to customer. *Journal of Operations management*, *19*(2), 201-217.

Tybout, J. R. (2000). Manufacturing firms in developing countries: How well do they do, and why?. *Journal of Economic literature*, *38*(1), 11-44.

Van Hoek, R. I., Vos, B., & Commandeur, H. R. (1999). Restructuring European supply chains by implementing postponement strategies. *Long Range Planning*, *32*(5), 505-518.

Venkatraman, N., & Ramanujam, V. (1986). Measurement of business performance in strategy research: A comparison of approaches. *Academy of management review*, *11*(4), 801-814.

Wang, Q., Wang, Z., & Zhao, X. (2015). Strategic orientations and mass customisation capability: the moderating effect of product life cycle. *International Journal of Production Research*, *53*(17), 5278-5295.

Ward, P. T., Bickford, D. J., & Leong, G. K. (1996). Configurations of manufacturing strategy, business strategy, environment and structure. *Journal of management*, *22*(4), 597-626.

Wathen, S. (1995). Manufacturing strategy in business units. *International Journal of Operations & production management*, 15 (8), 4-13.

Were, A. (2016). Manufacturing in Kenya: Features, challenges and opportunities. *Supporting Economic Transformations*: Nairobi.

Wernerfelt, B. (1984). A resource-based view of the firm. *Strategic management journal*, *5*(2), 171-180.

Westbrook, R., & Williamson, P. (1993). Mass customization: Japan's new frontier. *European Management Journal*, 11(1), 38–45.

William, M., & Ryan, C. (2009). Before Pine and Dell: Mass Customization in Urban Design, Architecture, Linguistics, and Food. *Research in Mass Customization and Personalization: Strategies and Concepts-Applications and Cases*, 139.

Wilson, J. (2014). *Essentials of business research: A guide to doing your research project*. Sage.

World Bank (2016). The World Bank: Knowledge Resources. Retrieved from www.worldbank.org on 26th Jan 2017.

Worren, N., Moore, K., & Cardona, P. (2002). Modularity, strategic flexibility, and firm performance: a study of the home appliance industry. *Strategic management journal*, *23*(12), 1123-1140.

Yue, S., Pilon, P., & Cavadias, G. (2002). Power of the Mann–Kendall and Spearman's rho tests for detecting monotonic trends in hydrological series. *Journal of hydrology*, *259*(1), 254-271.

Zhang, M., Qi, Y., Zhao, X., & Duray, R. (2015). Mass customisation systems: complementarities and performance consequences. *International Journal of Logistics Research and Applications*, *18*(6), 459-475.

Zhang, Q., Vonderembse, M. A., & Lim, J. S. (2003). Manufacturing flexibility: defining and analyzing relationships among competence, capability, and customer satisfaction. *Journal of Operations Management*, *21*(2), 173-191.

Zipkin, P. (2001). The limits of mass customization. *MIT Sloan Management Review*, *42*(3), 81.

APPENDIX ONE: INTRODUCTION LETTER

Strathmore
UNIVERSITY

22nd February, 2017

TO WHOM IT MAY CONCERN

Njaramba Faith Njambi -62373

Ms Faith Njambi Njaramba is a postgraduate student in our Master of Commerce (MCom) programme. In partial fulfilment of the MCom degree, students are required to carry out a research project and write a thesis on a contemporary subject within their field of specialisation. Among other activities, the project involves data collection and analysis.

Faith is requesting to gather information to be used in her research. The information she will obtain from your organization will be used for this academic purpose only and will be kept confidential. The results of the survey will be in summary form and will not disclose any individual, company name or company information in any way.

The research study is entitled **"THE INFLUENCE OF MASS CUSTOMIZATION CAPABILITIES ON OPERATIONAL PERFORMANCE OF MULTINATIONAL MANUFACTURING FIRMS IN KENYA."**

We hope that your organization can assist by providing information to the above named student.

Yours faithfully,

Josphat Manani
MCOM Coordinator
School of Management and Commerce
Email: jmanani@strathmore.edu

APPENDIX TWO: QUESTIONNAIRE

Instructions

This questionnaire is a data collection tool for the study, **"The influence of mass customization capabilities on operational performance of multinational manufacturing firms in Kenya.**"

Kindly answer the questions by putting a tick in the appropriate box or by writing in the space provided

Confidentiality

All information collected will be treated as confidential and reference will not be made to any company or respondent in the report of this study.

SECTION A

Company profile

1. Name (Optional) **……………………………………………………………………**
2. In how many countries does your company have a manufacturing plant? **…………….**
3. How long has the firm been in operation in Kenya?

   Less than a year ☐

   1-5 years ☐

   5-10 years ☐

   10-15 years ☐

   15-20 years ☐

   More than 20 years ☐
4. How long has the parent firm been in operation?
5. Less than a year ☐

   1-5 years ☐

   5-10 years ☐

   10-15 years ☐

   15-20 years ☐

   More than 20 years ☐

6. What is the size of your firm in Kenya?

a. In terms of employees

Less than 50 ☐

51- 100 ☐

Over 100 employees ☐

b. In terms of asset base in Kenya Shillings

1-100 million ☐

101-500 million ☐

Over 500 million ☐

7. What is your ownership structure composition?

Foreign ☐

Foreign and local ☐

Local ☐

8. What is the type of decision making process in your company?

Centralized ☐

De-centralized ☐

Both ☐

SECTION B

Mass customization capabilities

The following statements relate to mass customization capabilities among manufacturing firms, kindly indicate the extent to which you agree or disagree with the statements on a likert scale of 1-5 by ticking in the appropriate space.

The number labels mean; **1 strongly disagree, 2 disagree, 3 somehow agree, 4 agree, 5 strongly agree**

Statement			Scale				
			1	2	3	4	5
1.	Solution space development	1. We constantly monitor changes in our customer preferences for variety					
		2. We produce a wide variety of products for our customers					
		3. We identify product attributes along which customer preferences differ most					
		4. We constantly adapt product variety offered to changing customer requirements					
		5. We have developed routines to determine the optimal amount of variety we offer					
		6. Any other (Please specify)					

2.	Robust process design	1. We operate at different levels of output					
		2. We operate profitably at different levels of production volume					
		3. We produce different products in the same plant at the same time					
		4. We are able to easily vary the quantities of products produced					
		5. We are able to easily change from one product to another					
		6. Any other (Please specify)					
3.	Customer choice navigation	1. We are able to navigate our customers through the customization process					
		2. We provide customers with visualizations of their product configurations.					
		3. We allow customers to compose products to their specific needs					
		4. We easily enable customers to find the optimal product configuration					
		5. We provide customer guidance and support throughout the product configuration process					
		6. Any other (Please specify)					

SECTION C

Operational firm performance

The following statements relate to the operational performance of a manufacturing company, kindly indicate the extent to which you agree or disagree with the statements by ticking in the appropriate space. The number labels mean;

1 strongly disagree, 2 disagree, 3 somehow agree, 4 agree, 5 strongly agree

			1	2	3	4	5
1.	Quality of goods	1. Our products always conform to specifications					
		2. We always produce durable customized products					
		3. We always ensure that we customize the features of products according to customer preferences					
		4. Majority of our manufactured products pass final inspection stage					
		5. We always produce high quality goods					
		Any other (Please specify)					
2.	Flexibility of operations	1. We are able to cope with changes in the product mix					
		2. Our production plant is able to achieve					

		profitability at different production levels					
		3. We usually introduce new products speedily					
		4. Our production plant has the ability to run various batch sizes					
		5. We always use an automated raw material re-ordering system					
		Any other (Please specify)					
3.	Product Delivery	1. We always deliver mass customized goods on time					
		2. We always have a short delivery cycle of mass customized goods					
		3. We always have a low order response time					
		4. We always have a short production lead time					
		5. We always have an accurate inventory status					
		6. Any other (Please specify)					

4.	Cost of goods	1. We always maintain a low unit cost of manufacturing					
		2. We always maintain a low product servicing cost					
		3. We always maintain a low cost of keeping the production plant running					
		4. We always maintain a low selling price					
		5. We are able to maintain a low changeover cost when changing from one product to another					
		6. Any other (Please specify)					

Thank you for taking part in this study!

APPENDIX THREE: LIST OF MULTINATIONAL MANUFACTURING FIRMS IN KENYA

Table I: Target population

Company	**Sector**	**Country of origin**	**Contact**
1. Achelis group	Medical and industrial equipment	Germany	akl@acheliskenya.co.ke +254-20) 6532777
2. Amiran Kenya	Chemical fertilizers and irrigation equipment	UK	pr@amirankenya.com 0719095000
3. Assa Abloy EA limited	Locks and security doors	Sweden	info.kenya@assaabloy.com +254 206531569
4. Unga group		Kenya	
5. Atlas Copco Kenya Ltd	Industrial tools, pumps, air compressors and generators	Sweden	0703054000
6. Farmers Choice	Food processing		
7. Avery Kenya Ltd	Weighing equipment and industrial bearings	UK	avery@averyafrica.com +254 558 506 / 7, 559 004, 300 1675
8. Bamburi Cement	Cement	France	+254 20 2893000
9. BASF East Africa	Construction chemicals,	Germany	+254 20 4443453

	paints, performance plastics		
10. Bata Shoe Company (Kenya)	Shoes	Switzerland	0726668941 customer.service.kenya@Bata.com
11. Baumann Engineering Limited	Electrical and construction equipment	Kenya	P.O Box 30092 Kampala Rd, Nairobi, Kenya
12. Bayer East Africa	Agricultural chemicals	Germany	0715407326 monicah.john@bayer.com
13. Beiersdorf East Africa	Personal care	Germany	francis.afulani@beiersdorf.com +254 730186000
14. Berger Paints	Paints	UK	+254 702 007 700
15. Highchem pharmaceuticals			
16. Aspen Beta Healthcare International Limited	Healthcare	UK	0724257072
17. Bidco Oil refineries	Cooking oil, soaps	Kenya	+254 1672821000
18. BOC Kenya Ltd	Industrial gas	UK	+254.20.69.44.000
19. Bonar EA ltd	Plastic bags	UK	0721977458
20. Twiga Chemicals			

21. British American Tobacco	Tobacco	UK	+254 (0) 711 062 000 victoria_kaigai@bat.com
22. Brookside Dairy Limited	Dairy products	Kenya	+254 20 2506210
23. Buyline industries	Personal care	Kenya	+254 20 3564752
24. Cadbury Kenya	Confectionary	UK	+254 20 530001
25. Cadila Pharmaceuticals ltd	Pharmaceutical	India	cadila@swiftkenya.com 0722509988
26. Cargill Kenya Ltd	Tea brands	Kenya	mombasa_Kenya@cargill.com
27. Ceva Animal Health Eastern Africa	Veterinary medicine	Sweden	antoine.lecointe@ceva.com Tél. : +254(0)714 279 061
28. Vivo	Oil and gas		
29. Chloride Exide-Emmerson	Solar energy equipment, car battery, water heating system	India	customerservice@chlorideexide.com 0719 080000
30. Coates Bros (EA)	Printing inks, synthetic resins, and industrial surface coatings.	South Africa	coates.ea@coatesbrothers.co.ke +254 (020)-2330501
31. Coca-Cola	Beverages	USA	+254 20 6998000

32. Colgate Palmolive (EA) Ltd	Personal care products	USA	info@colpal.com +254 20 3748901+254721534044
33. Cooper K-Brands	Animal health	Kenya	+254 722 209 840 / +254 734 330 044 Email: info@coopers.co.ke
34. De la Rue Ltd United Currency	Currency	UK	+254 703 090000
35. Del Monte	Juices, canned fruit	USA	+254 20 2141601
36. Dormans Ltd	Coffee	Kenya	+254-202733420
37. Decase Chemicals			
38. Dunlop Kenya	Rubber, tyres	UK	+254 20 650046
39. East Africa Cables	Cables	Kenya	+254 20 6607000
40. East Africa hides	Hides	Kenya	254-20-554 317
41. East African Brewery/ Diageo	Beverage	UK	+254 020 864 4000
42. East African Packaging Industries	Packaging materials	Kenya	sales@eapi.co.ke +254 (0) 20 3955000
43. East African Packing Industries	Cartons and sacks	Kenya	Administration : +254 (0) 20 3955000 Administration Cell : +254 722373476, +254 733604685
44. Chandaria Industries		Kenya	

45. MRM	Roofing solutions		
46. General Electric	Machinery	USA	+ 254 (20) 421 5000 +254 (20) 421 5044 +254 719093044 +254 719 093000
47. General Motors East Africa	Automotive assembly	USA	Tel: 254 20 6936000Fax: 254 20 6936499/199.
48. Gestetner Kenya	Printing supplies, furniture	UK	+254 20 652597
49. Glaxo Smith Kline Kenya Ltd	Pharmaceuticals, healthcare	UK	+254 20 6933200
50. Haco Industries and Tiger Brands	Home care and Personal care	Kenya & South africa	+245 20 8642000
51. Happy Cow Limited	Milk products	Holland	info@happycowkenya.com +254-020-231-3898
52. Henkel Kenya Limited	Adhesives, detergents, cosmetics	Germany	+254 707 183 449
53. Hwan Sung Industries (Kenya) Ltd	Furniture	Korea	hwansungke @ gmail.com 020 823319/20
54. Kapa oil refinaries	Cooling oil, soaps	Kenya	+254206420000

55. Kenafric Industries Limited	Confectionary	Kenya	admin@kenafricind.com tel +254 730 700000
56. Kenya Nut Company Ltd	Nuts	Kenya	+254 20 2218200
57. Kenya shell ltd	Petroleum products	Netherlands	+254 20 3205555
58. Kenya United Steel Ltd (KUSCO)	Steel	Kenya	+25441225436
59. East African Portland Cement Company (EAPC)	Cement	France	Customercare@eapcc.co.ke +254709 855 000
60. Loreal Kenya	Personal care	France	Emily@ginadin.com +254 724 926 269
61. Nestlé Foods	Foods	Switzerland	consumers@ke.nestle.com +254 20 3990000
62. Norbrook Kenya			
63. Novartis Kenya	Pharmaceuticals	Switzerland	+254 20 273 7771,
64. Oil Libya Lube Blending	Lube	Dubai	254 20 3622300
65. Osho Chemicals Industries Ltd	Animal health and public health chemicals	Kenya	+254 20 3912000
66. Pepsi Co ltd	Soft drinks	USA	+254 20 2219099

67. Pfizer Laboratories Ltd	Pharmaceuticals	USA	+254-721897552
68. Philips East Africa	Health Systems, Personal Health and Lighting Solutions	USA	philips.eastafrica@philips.com 254 (0)20663 6000
69. Procter and Allan EA	cereal	Kenya	+254 20 556361
70. Procter and Gamble EA Ltd	Personal care, household care products	USA	+254 20 3601300
71. PZ Cussons & Co Ltd	Personal care products	UK	254722 207 204/5 or +254 734 652 030/1
72. Carbacid	Gas and dry ice	Kenya	+254 (020) 2507444
73. Rectitt Benkiser	Personal care, household care products	UK	aseem.soni@reckittbenckiser.com +254 20 534427 +254 (734) 204145
74. Rolmil Kenya Ltd	Metal and allied	Kenya	rolmil@wananchi.com +254 20 55 2509
75. Sadolin paints	paints	Denmark	+254 20 6555711
76. Sandvik (Kenya)	Metal cutting tools, stainless steel	Sweden	+254 20 532866
77. Schindler			Tel. +254 20 340669
78. Signode *Kenya*	Engines, automotive parts	USA	+254 20 2135002

79. Silentnight	Mattresses, furniture	UK	0722512273
80. SKF (Kenya) Ltd	Ball and roller bearings	USA	+254 20 6536006
81. Slumber land	Mattresses, furniture	UK	254 020 8088885, 0722 204310, 0733 639313 info@slumberland.co.ke
82. Syngneta E A Ltd	Agricultural chemicals	Switzerland	+254703018000 /+254703019000
83. Tata- Magadi Soda	Soda ash	India	info@magadisoda.co.ke +254 (0) 20 6999 000
84. Tetra Pak	Packaging materials	Sweden	+254 71 102 1000, +254 20 690 9000
85. Texchem Ltd	dyes	Malaysia	+254 20 4440671
86. The Wrigley Company (EA) Ltd	Chewing gum	USA	infokenya@*wrigley*.com. Call Us: +254-20-3952000
87. Total Kenya Limited-Lubes Blending plant	petroleum	French	+254-20-289 7333 or +254719 027333,
88. Ubrica pharma limited	Medicines	USA	(+254) 722 743 174
89. Ubbink East Africa	Solar products	UK	+254 020 216 775 7
90. Unilever Kenya		UK	+254 20 6922000
91. Vitaform	Mattresses	UK	+254 722 205535
92. Weetabix	cereal	UK	Tel.: (+254) 20 6652377/ 6536114 / 6553130 / 8062223 / 6557542

			Mobile:(+254) 700330831 Email: weainfo@weetabix.com
93. Weltech Industries	Steel	India	(254) 20 55 44 46