THE RELATIONSHIP BETWEEN MANUFACTURING STRATEGY AND OPERATIONAL PERFORMANCE WITHIN THE METAL & ALLIED SECTOR IN KENYA

BY

MUTHAMA FRANCIS KYENGO

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Declaration

I, the undersigned, declare that this MBA project is my original work and has not been submitted for any award to any other college, institution or university other than the University of Nairobi.

Signed: ________________________ Date: ______________________

Francis K. Muthama

D61/70402/2009

This MBA project has been submitted with our approval as the appointed supervisors.

Signed: ________________________ Date: ______________________

Dr. James Njihia

Department of Business Administration

School of Business, University of Nairobi

Kenya

Signed: ________________________ Date: ______________________

Mr. Job Mwanyota

Department of Business Administration

School of Business, University of Nairobi

Kenya

Dedication

I dedicate this work to my family for they were supportive of me in the course of my studies. They made this happen and I shall forever be grateful to them for what they sacrificed to get it done.

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I sincerely thank all those individuals whose encouragement and support made the completion of this study a reality. This research project would not have been successful without your invaluable support, understanding, assistance and guidance.

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Abstract

The purpose of this study was to establish the relationship between manufacturing strategy and operational performance among firms in the metals and allied sector. It sought to find out which manufacturing strategies are used, which factors were considered when choice of manufacturing strategy was made and whether there exists a relationship between manufacturing strategy and operational performance. A descriptive study based on a census research design was conducted using structured questionnaires to collect data from operations/factory managers or their equivalents in 71 Kenyan manufacturing firms in the metals and allied sector. Descriptive statistics was used to analyze and determine the formality of the manufacturing strategy formulation process, participants in the formulation process, manufacturing strategies used in terms of competitive priorities and critical decisions relating to the design of process and infrastructure. A multiple regression model was used to evaluate the overall relationship between manufacturing strategy and operational performance. The findings showed that manufacturing strategy formulation followed a formal process with both top down and bottom up participation thus ensuring that the capabilities and competencies of the organization along with inputs from lower managers were factored in when developing the manufacturing strategy, the top seven manufacturing strategies were; manufacturing with consistent quality and low defects, giving focus on increasing delivery reliability, improve product performance and reliability, reducing overhead costs, implementation of quality circles, reduction in manufacturing lead time and improving delivery speed and suggested the presence of trade-offs with quality and delivery focus as the dominant manufacturing priorities, the firms placed infrastructural decisions such as sustainable competitive advantage and quality assurance ahead of structural decisions such as capacity and that the firms have adopted manufacturing strategies based on four major factors or components; competitiveness, customer focus, internal capabilities and manufacturing excellence. Multiple regression analysis results showed that there is a positive relationship between manufacturing strategy and operational performance in Kenyan manufacturing firms in the metals and allied sector. This study has provided insights into the extent of adoption of manufacturing strategy in Kenyan manufacturing firms and provides further evidence that implementation of manufacturing strategy is significant in enhancing operational performance improvement.

List of Abbreviations

ADB – African Development Bank

BPR – Business Process Re-engineering

KAM – Kenya Association of Manufacturers

KNBS – Kenya National Bureau of Statistics

RBV – Resource Based View

ROA – Return on Assets

ROS – Return on Sales

TQM - Total Quality Management

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CHAPTER ONE: INTRODUCTION

1.1 Background to the study

Manufacturing companies are under increasingly diverse and mounting pressures due to more sophisticated markets, changing customer choice and global competition. The market for products is becoming increasingly international. In such a competitive scenario companies have to search for new processes, new materials, new vendors, new shop floor designs and new channels to deliver products and services at competitive prices (Dangayach & Deshmukh, 2001).

Manufacturing strategy theory arguably has its origins in Selznick (1957) who placed emphasis on the difficulty of changing the distinctive competence and less on the competitive advantage or disadvantage it afforded. The concept of manufacturing strategy began to gain the attention of researchers following the seminal work of Skinner (1969) who at that time noted that manufacturing was not being accorded the proper role in corporate strategy development and that instead of manufacturing becoming an important tool of corporate strategy, it had become a liability. Skinner's (1969) initial arguments led to a number of research papers on manufacturing strategy. Some of the initial studies sought to develop further the need to recognize the competitive advantage that manufacturing strategy provided (Buffa, 1984; Hayes & Wheelwright, 1984; Prahalad & Hamel, 1990). Skinner (1974) described common competitive performance criteria for manufacturing strategy such as short delivery cycles, superior quality and reliability, dependable deliveries, fast new product developments, flexibility in volume changes and low cost. Skinner (1969, 1974) developed this specifically for the manufacturing function with the theory of the focus and trade-offs and the concept of the "manufacturing task" which has subsequently been elaborated into competitive criteria by (Wheelwright, 1978). Wheelwright (1978) identified efficiency, dependability, quality and flexibility as the most important general criteria for evaluating manufacturing strategy. Later, Hayes and Wheelwright (1984) delineated four basic competitive priorities: cost, quality, dependability and flexibility. Other notable scholars who have contributed to manufacturing strategy theory include: Hayes and Schmenner (1978) who enlarged the principal features of manufacturing strategy; Hill (1985, 1993) developed the concept of order winners; Hayes and Wheelwright (1984) who described manufacturing strategy to consist as a consistent pattern of decision making and grouped manufacturing related issues into decision categories; Ferdows and De Meyer (1990) enhanced the cummulative capabilities model or sand cone model; Hayes and Pisano (1996) who looked at manufacturing strategy from the beyond world class perspective and Voss (1995) introduced the concept of manufacturing strategy paradigms.

Most researchers regard manufacturing simply as a process of transforming materials into products and propose ideas to make manufacturing work more efficiently and effectively. Manufacturing strategy then concerns the question of how to pursue specific competitive priorities efficiently and effectively according to changes in corporate strategy and the internal and external environment. In the focus and fit perspective dominating this approach, the emphasis is on offering customers what they want (Riis, Johansen, Waehrens & Englyst, 2007).

The environment of manufacturing has faced significant changes in the past decade. In fact, the most notable challenges for manufacturing are increased levels of complexity and uncertainty coming from increased globalization of markets and operations, the diversified demands of customers, drastic reductions in product lifecycles and manufacturing and ICT technology progress. In a word, the knowledge base for manufacturing has become more complex and this process is likely to continue (European Commission, 2004).

This has resulted in intensified competition which has reached the point where costs and quality have become the key competitive issue. The new competition is in terms of reduced cost; improved quality, products with higher performance, a wider range of products and better service, and all delivered simultaneously (Dangayach & Deshmukh, 2001). Most of the manufacturing firms in Kenya are still very far from world class practices.

1.1.1 Manufacturing Strategy

Manufacturing strategy as a concept was first recognized by (Skinner, 1969) who saw manufacturing strategy as a missing link between the corporate strategy and Production. Skinner (1969) noted that manufacturing was not being accorded the proper role in corporate strategy development and that instead of manufacturing becoming an important tool of corporate strategy, it had become a liability. Firms often had a too simplistic view of manufacturing, having low costs as the only demand and this view, however, missed several dimensions of manufacturing, which lead to both missed opportunities and mismatch problems in the production (Skinner, 1969).

Manufacturing strategy is a functional-level strategy and is a component of a firm’s business-level strategy as observed by Anderson, Cleveland and Schroeder (1989) and specifies the means by which operations implements corporate strategy and helps to build a customer driven firm (Krajewski, Ritzman & Malhotra, 2010). Therefore manufacturing strategy is an important part of the firm’s business strategies, comprising a set of well-coordinated objectives and action programs aimed at securing a long-term, sustainable advantage over competitors and are consistent with the firm's overall strategies, as well as with other functional strategies (Fine & Hax, 1985).

Manufacturing strategy is therefore a plan for developing resources and configuring processes such that the resulting competencies maximize net present value and consists of a sequence of decisions that over time, enables a business unit to achieve a desired manufacturing structure, infrastructure and set of specific capabilities (Hayes & Wheelwright, 1984). Manufacturing strategy is not just about aligning operations to current competitive priorities but also about selecting and creating the operating capabilities a company will need in the future (Hayes & Pisano, 1994). It can therefore be viewed as the effective use of manufacturing strengths as a competitive weapon for the achievement of business and corporate goals (Swamidass & Newell, 1987).

The concept of manufacturing strategy has led to the development of several theoritical frameworks. These include the concept of competitive priorities (Skinner, 1969), the focussed factory (Skinner, 1974) and other offshoots such as the cumulative capabilities model (Nakano, 1986; Ferdow & De Meyer, 1989). Other concepts include the four-stage model of operations contribution and decision categories (Hayes & Wheelwright, 1984); the resource based view of manufacturing strategy which consists of adapting capabilities of the firm to match market requirements (Voss, 1995; Hayes & Pisano, 1996); the market based view (Waters, 2006; Lopez, 2005); the concept of order winners and order qualifiers (Hill, 1985, 1995); Hills framework for strategy formulation (Hill, 1985). There are other less familier theories such as the paradigms of manufacturing strategies consisting of competing through manufacturing, strategic choices in manufacturing and best practices (Voss, 1995).

Manufacturing strategy is made up of two components; process and content. There are two generic variables which constitute the content of a manufacturing strategy. These are manufacturing task and policy decisions, which are now widely accepted as being the core of manufacturing strategy (Leong, Snyder & Ward, 1990). The first element is a statement of what the manufacturing function must accomplish (Skinner, 1978). This statement is commonly referred to as the manufacturing task and is defined in terms of the capabilities the manufacturing unit must have in order for the firm to compete given its overall business and marketing strategy has been linked to customer needs by defining it in terms of those capabilities that are critical to winning customer orders (Hill, 1989). The second element of a manufacturing strategy is defined by the pattern of manufacturing choices that a company makes and is classified into two categories i.e. structural decisions about facilities, technology, vertical integration, and capacity and infrastructure decisions such as organization, quality management, workforce policies, and information systems architecture (Hayes & Wheelwright, 1984).

The content of manufacturing strategy has been viewed as the strategic choices in process and infrastructure (Voss, 1995). Areas relating to content include manufacturing capabilities, strategic choices, best practices, trans-national comparisons, performance measurement, plans and actions that shape strategic directions (Voss, 1995). Slack and Lewis (2008) described the content of manufacturing strategy as the strategic decisions which shape and develop the long-term direction of the operation and form the building blocks from which any operations strategy will be formed. This includes the definition attached to individual performance objectives, together with a prioritization of those performance objectives and also includes an understanding of the structure and options available in the four decision areas of capacity, supply networks, process technology, and development and organisation (Slack & Lewis, 2008). Boyer and Lewis (2002) showed that there is some agreement among researchers as to the framework and contents that comprise manufacturing strategy at the level of an individual plant. Boyer and Lewis (2002) described this as the prevailing model of the content of operations strategy.

Slack and Lewis (2008) refer to process as the way in which operations or manufacturing strategies are formulated i.e. the process of operations strategy determines how an organization pursues the reconciliation between its market requirements and operations resources in practice.

There are three generic approaches to developing manufacturing strategies which can be identified in the mainstream manufacturing strategy literature. The first, which can be described as the top-down process is meant as the formulation of corporate strategy, and subsequently business and operations strategy (Skinner, 1969). The second approach is the bottom-up approach to strategy formulation which links in with the concepts of core competence (Cleveland, Schroeder & Anderson, 1989; Prahalad & Hamel, 1990; Vickery, 1991); core capabilities (Stalk, Evans & Shulman, 1992). The third generic process that can be used to develop a manufacturing strategy can best be described as iterative and is the one that is implicit in Hill's framework (Hill, 1985). He advocated the five step approach to the development of the corporate, marketing, business and manufacturing strategies.

1.1.2 Operational Performance

Business performance is primarily measured at two levels: the domain of financial performance or the domain of operational performance (Venkatraman & Ramanujam, 1986). Financial measures, such as ROI, profitability *etc.*, are usually plant level measures that are subject to many factors outside the scope of manufacturing operations. An attempt to isolate the performance of the operations function is to utilize measures where the management of operations plays an integral part, *i.e.* operational performance measures (Boyer & Lewis, 2002). In this study, we are measuring manufacturing performance at the plant level. Since the plant does not control sales or costs outside the plant, overall financial measures of plant performance are not appropriate. Rather the basic dimensions of plant performance which are controlled by the plant are used: cost, quality, delivery, and flexibility (Ferdows & De Meyer, 1990; Skinner, 1969). It is difficult to fairly assess manufacturing performance and plant-level manufacturing performance has therefore traditionally been assessed using at least four factors: cost, quality, speed (delivery) and flexibility performance (Ferdows & De Meyer, 1990; Skinner, 1969). Miguel and Brito (2011) state that the competitive priorities framework can be thought as way to conceptualize and measure operational performance or even competitiveness. Improvements in performance can manifest themselves in different aspects like inventory reduction, lead time reduction or quality improvement (Miguel & Brito, 2011). Grouping these types of improvements under the broader classes of competitive priorities as cost, quality, delivery and time could then be a useful measurement approach allowing comparability, comprehensiveness and theoretical underpinning (Miguel & Brito, 2011).

Quality is a multifaceted term. According to Garvin (1987) quality can be viewed from up to eight different perspectives; performance, features, reliability, conformance, durability, serviceability, aesthetics and perceived quality. Within manufacturing operations the conformance dimension is most influential since it refers to the process ability to produce products to their predefined specification reliably and consistently (Slack & Lewis, 2008). High levels of conformance quality must be attained before trying to improve any other of the performance dimensions (Ferdows & De Meyer, 1990; Nakane, 1986). The logic being that scrap and rework is the outcome from poor conformance quality which in turn requires more buffers and the like and internal measures of quality performance include percentage of products that pass final inspection, scrap rate among others (Hallgren, 2007). Customer satisfaction is often regarded as the prime measure of external quality performance and quality which falls short of expectations has a greater impact on satisfaction and repurchases intentions than quality which exceeds expectations (Anderson & Sullivan, 1993).

The two main dimensions of delivery performance are delivery reliability and delivery speed and although the dimensions are separable, long run success requires that promises of speedy deliveries be kept with a high degree of reliability (Ward, Bickford & Leong, 1996). Delivery reliability is sometimes referred to as dependability or on-time delivery and concerns the ability to deliver according to a promised schedule or plan and is the ability to deliver products and services in accordance with promises made to customers (Hallgren, 2007). Hallgren (2007) described delivery speed as concerned with the length of the delivery cycle and is from a market perspective, the elapsed time from the receipt of a customer order to final delivery (Handfield & Pannesi, 1992). Hallgren (2007) argued that delivery performance was the ability to do things quickly in response to customer demands and thereby offer short lead times between when a customer orders a product or service and when they receive it. While this definition was quite straightforward for organizations operating in a make-to-order strategy, for organizations operating under a make-to-stock strategy this definition was rather strange since the actual customer order enters the system more or less on the shelf leading to a delivery lead time that is zero (Hallgren, 2007). In make-to-stock strategy, high delivery reliability is interpreted as the percentage of orders filled directly from inventory while in make-to-order environments delivery reliability is to honour the promises made to customers (Hallgren, 2007).

Flexibility is also regarded to be a multidimensional concept (Gerwin, 1993). D'Souza and Williams (2000) defined four dimensions of manufacturing flexibility; volume, variety, process and material handling flexibility. Further, they noted that volume and variety are "mainly externally driven" towards meeting the needs of the market. Similarly, Slack (1987) proposed that volume, mix, new-product, and delivery-time flexibility as those types that directly influence the competitive position of the company. Within existing manufacturing operations the most influential types are the ability to adjust manufacturing volume and the ability to change between products (Olhager, 1993). A property that distinguishes flexibility from other dimensions of operational performance is that it is a measure of potential rather than actual performance (Slack & Lewis, 2008). Also, the level of flexibility is not directly evaluated by the customer; it is more of an operational means to provide possibilities for more customized products and product deliveries (Slack & Lewis, 2008). Flexibility can thus be referred to as an enabler, enabling the manufacturing system to offer shorter delivery lead times, wider product range *etc*. The externally visible properties of a highly flexible manufacturing system include a very broad product range, major opportunities to product customization and highly flexible delivery times (Slack, 1983). One example of flexibility is mass customization which is the ability of a firm to produce highly customized goods and services and to do it at the high volumes of mass production (Slack, 1983).

Cost is an absolute term and measures the amount of resources used to produce the product. Slack and Lewis (2008) stress that all producers, even those whose primary source of competitiveness is different from product selling price will be interested in keeping their costs low. Every dollar removed from the operation's overall cost is a dollar added to the bottom line profits. Therefore cost performance is the most important of the different operational performance dimensions (Slack & Lewis, 2008). It is important to note is that a reduction in the actual cost of manufacturing does not necessarily translate to an equally large decrease in the products selling price, *i.e.* there are managerial degrees of freedom in the distribution of cost reductions (Hallgren, 2007).

1.1.3 Effect of Manufacturing Strategy on Operational Performance

Manufacturing affects overall business strategy, and business strategy affects manufacturing and when corporations fail to recognize the relationship between manufacturing strategy and corporate strategy, they become burdened with seriously noncompetitive production systems, which are time consuming to change (Skinner, 1969). The existence of a relationship between manufacturing strategy and performance has long been supported by the manufacturing strategy literature (Ward & Duray, 2000). Swamidass and Newell (1987) showed that performance was positively related to a particular manufacturing strategy, flexibility.

A number of studies have shown that quality is linked with good performance such as Ferdows and De Meyer (1990) who have argued that effective manufacturing strategies generally begin with quality as a base and that a quality strategy that allows a firm to achieve both high design and conformance quality ultimately leading to the attainment of a higher reputation in the market place, cost reduction, and higher productivity that can translate into higher sales growth and increased market share. Several studies describing world class manufacturers suggest that the best competitors compete on the basis of a variety of manufacturing capabilities (Flynn, Schroeder, & Sakajibara, 1995; Ward et al., 1996).

Low cost manufacturing strategies can lead to improvements in operational efficiencies that a firm can use to reduce its price and all things being equal achieve an increase in sales growth and market share (Amoako-Gyampah & Acquaah, 2008). A firm that develops such a manufacturing strategy that allows it to achieve volume and mix flexibility while keeping costs low and quality high will be able to respond faster to market changes and thus achieve higher performance (Amoako-Gyampah & Acquaah, 2008).

Finally, a firm with manufacturing strategies based on reliable and on-time deliveries can expect greater customer satisfaction that can potentially lead to increased sales growth and market share (Amoako-Gyampah & Acquaah, 2008).

1.1.4 The Metals and Allied sub-sector in Kenya

The metals and allied is a sub sector of the manufacturing sector. Data from the Kenya Association of Manufacturers (KAM, 2013) indicates Kenya’s metal industry is broadly classified as Cold Rolling, Galvanizing and colour coating, Foundry and Forgers, General Fabricators & Allied industries, Pipes and tubes, Smelting and Hot Rolling and Wire and Wire Products. The sector has 71 members who constitute 9.65 per cent of the entire membership (KAM, 2013). Manufacturing sub-sectors registered improved performances in the year up to August 2012. Production of galvanized sheets grew 3.5% to 262,680 tonnes, compared with 253,688 tonnes during the same period in 2011. While the manufacturing sector in Kenya has a high potential for growth, it was inhibited in 2012 by high production costs, mainly stemming from the high cost of credit (African Development Bank [ADB], 2013). Growth in the sector was undermined by increase in price of primary inputs, fuel costs and depreciating Kenya shilling which increased cost of imported intermediate inputs (Kenya National Bureau of Statistics [KNBS], 2012).

1.2 Research Problem

Locally firms in the metals & allied sector have encountered challenges in their attempts to become world class such as not having adopting manufacturing strategies and incorporating them in their functional strategies and as a consequence have failed to achieve the desired results. Managers have no clear, consistent definition or understanding of the manufacturing task facing the organization and this result in mismatch between the market requirements and manufacturing (Skinner, 1969). Consequences are reflected in longer lead times, cancelled orders, longer manufacturing cycle times, excess inventory or even mismatch in capacity. Another issue concerns the manufacturing policies and the infrastructure being employed. These are inconsistent. Taken together, there is a distortion in coordination and the firm's lacks focus as they are attempting to cover too many technologies or too many products and markets, too wide a range volume, and more than one manufacturing task. Other issues include putting too much emphasis on short-term financial performance at the expense of research and development, failing to consider customer wants and needs and placing too much emphasis on product and service design and not enough on process design and improvement (Skinner, 1969).

There have been many studies linking manufacturing strategy to business performance (Swamidass & Newell, 1987; Ward, Leong & Boyer, 1994). Demeter (2003) researched how manufacturing strategy contributes to company level competitiveness. Avella, Fernandez and Vazquez (2001) analyzed the growing importance of manufacturing strategies for the competitiveness of firms. They considered that the emphasis on certain manufacturing competitive priorities (or capabilities) and decisions or practices (on the key decision areas) and that their internal coherence could be the base for achieving sustainable or lasting advantages over competitors, thus originating superior business performance. However, with few exceptions (Amoako-Gyampah & Boye, 2001; Amoako-Gyampah & Acquaah 2008) most manufacturing strategy research has been confined to contexts involving developed economies where strategy implementation is perhaps well understood and practiced. Amoako-Gyampah and Acquaah (2008) examined how competitive strategy influences manufacturing strategy and the impact that manufacturing strategy and competitive strategy had on firm performance among Ghanaian manufacturing firms. Musyimi (2012) researched on manufacturing strategy in small and medium scale enterprises in Kenya and sought to establish the capabilities the firm had at its disposal to explore on its resources, the perspective / approach the firm chose to use to satisfy/meet its customer's requirement and lastly how it used these capabilities to gain advantage over its competitors. Meroka and Nyamwange (2003) surveyed the manufacturing strategies pursued by the large manufacturing firms in Kenya as a way of remaining a float in the turbulent environment. Other studies like Kinuthia (2004) examined the relationship between environmental management and manufacturing strategy in Kenyan firms.

None of the researchers examined the relationship between manufacturing strategy and operational performance and hence the research gap that this study sought to fill. This research attempts to answer the following research questions, What are the manufacturing strategies firms in the metals and allied sector have adopted?, What factors have influenced the firms to adopt the manufacturing strategies?, And how is manufacturing strategy related to performance?

1.3 Objectives of the Study

Other objectives of the study include:

i. Determining manufacturing strategies adopted by firms in the metals & allied sector.
ii. To establish which factors are critical to the selection of manufacturing strategy.
iii. To examine whether there exists a relationship between manufacturing strategy and Operational performance.

1.4 Importance of the Study

This study will be of significance to three key stakeholders: Practice, the metals and allied sector (managers and shareholders), Theory for researchers in academia and policy making in firms, central and regional governments.

To the industry players, the study will bring out the pertinent issues that must be considered before implementation of manufacturing strategies. It can provide the basis for future innovation by building a solid base of operations-based capabilities, skills and knowledge within the business. Knowledge gained can be used in managing capacity through formulating strategies for matching demand to supply, and managing throughput i.e. improving material, customer and information flow. Adoption of best practices reduces the costs of producing products and services by being efficient in the way it transforms inputs into outputs.

To the policy makers in firms, the study is a reference in making manufacturing policies and strategies regarding developing new products and services and process choice and layout.

To researchers, the study provides empirical evidence to validate or invalidate the arguments for and against manufacturing strategy and its role in enhancing performance in the metals and allied industry. Researchers will gain from the insights into the challenges associated with the implementation of manufacturing strategy and will serve as a basis for further research.

The proposed study will be of great importance to both the scholars and practitioners. It is expected to contribute to the body of knowledge in Manufacturing Strategy and will aim at building on what has been done in the area by previous researchers and scholars.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

This chapter involved looking back at the previous literature relating to the study. The first section gives the theories guiding the study with the theoretical foundations of manufacturing strategy which comprise of the resource based view, the market view, the competitive dimensions comprising of the tradeoffs, cumulative capabilities and concept of plant within plant, the concept of order winners, the decision categories and performance measures. The last section gives a summary of empirical studies.

2.2 Theoretical Foundations on Manufacturing Strategy

This section examined the various theoretical foundations of manufacturing strategy.

2.2.1 Resource-Based View

Resource Based View (RBV) advocates using the company's internal resources, competencies, and capabilities as essential determinants of strategy. This paradigm argues that differences in the firm's performance can be traced back to heterogeneous assets and capabilities owned by the company. RBV assumes that each firm has unique resources and capabilities (Wernerfelt, 1984).

The growth of the firm is subject to the efficient use of the resources and deployment of capabilities. The RBV states that the firm's resources and capabilities determine its competitive advantage and firms that enjoy superior capabilities relative to their competitors have significant advantage over competitors (Russo & Fouts, 1997). Within the resource-based view, resources and capabilities that can lead to competitive advantage are those that are valuable and nonsubstitutable, from the point of view of customers, and unique and inimitable, from the point of view of competitors (Barney, 1991; Grant, 1991).

Resources are productive assets that are owned by the firm, whereas “capability” is the ability of the firm to efficiently exploit these resources, to manufacture products or develop services to achieve business objectives (Amit & Shoemaker, 1993). Grant (1991) categorized resources into tangible, intangible and human resources. The tangible resources are financial capital, equipment, and manufacturing plant etc., while the intangible resources are the firm’s reputation, brand image and the perceived quality of its products. The intellectual capital or human resources are the skills and knowledge of its employees, and other knowledge-oriented assets.

Manufacturing strategy has adopted the notion of capabilities from the strategic management literature, particularly the resource-based view (RBV) of the firm (Wernerfelt, 1984; Barney, 1991). The capabilities are normally tacit, inimitable and non-transferable, and are firm-specific. They are developed over a period of time through the interplay of the firm’s resources (Amit & Shoemaker, 1993). Voss (1995) suggested that firms could compete through manufacturing by aligning manufacturing capabilities with competitive requirements of the market place. Hayes and Pisano (1996) suggested that a company needs to differentiate itself from its competitors on the basis of something valuable to the customer. The way to do this is to harness the benefits of various improvement programs or bundles of practices, like Lean manufacturing or TQM, in the service of a broader manufacturing strategy that emphasizes the selection and growth of unique operating capabilities (Hayes & Pisano, 1996).

The resource-based view is centered on the notion that most organizations consider themselves to be particularly good at some specific activities, but try to avoid head-to-head competition in others. The terms distinctive capabilities or distinctive competence are used to describe those unique aspects of operations through which the firm competes (Slack & Lewis, 2008). According to Gagnon (1999) the resource based view may assist manufacturing to reach up to the leadership of strategy thus ensuring a firm's resources, capabilities and competencies are properly used as competitive weapons, offer lessons in the management of capabilities providing clear rules to develop, protect and leverage resources in a dynamic manner and finally to overcome major failures in implementation of world class practices. The resource based view may help manufacturing strategy to better integrate the sources of strategic advantage within a coherent portfolio of optional capabilities (Gagnon, 1999).

2.2.2 Market-Based View

The market based view of operations strategy starts with analyzing the market, dividing it into coherent segments and identifying the most attractive segments in which to compete. Precise requirements of customers in these markets are identified, products designed with features that meet the demand and the operations are designed to make these products (Waters, 2006). Performance and competitive behavior are determined by market structure. The external environment, comprises of economic, technological, political, environmental and social issues, is relevant but the real emphasis is on the industry. A company's success is strongly influenced by the competitive forces, measured by five forces model (Porter, 1980). According to this perspective, business environment should be monitored frequently and customer's needs and preferences should be taken into consideration to develop dynamic capabilities (Lopez, 2005).

Distinctive capabilities come from operations that precisely match products and processes to customer demands with flexibility to satisfy different and varying demands (Waters, 2006). There are only three ways to compete; product differentiation, cost leadership and market niche (Porter, 1980). The most important thing is that the market and means of competing are translated into business strategy. Managers have to translate these requirements into an operations strategy (Waters, 2006).

Waters (2006) has stated that an operations strategy normally identifies a focus on certain types of features. A broader view would add many features but for simplicity, it is classified around five areas:-

i. Price – usually low price, based on an operations strategy of low unit costs through efficient operations, economies of scale, eliminating waste, low over heads etc.
ii. Quality – with an operations strategy of supplying products that are always fault free, perform well and meet or exceed customer expectations
iii. Speed – with operations that give short delivery times, fast flows of materials through supply chains, rapid design of new products etc.
iv. Flexibility – with operations that adjust to different customer tastes or work efficiently through rapid changes in demand.
v. A whole range of other features – including style, design, reliability, convenience etc.

2.2.3 Integration of Resource Based and Market Based Views

Though the recent literature suggests that resource-based view is more likely to prevail for the development of manufacturing strategy, the issue of integration of resource and market based views has also been deliberated, especially within the context of alignment of manufacturing and marketing strategies (Hooley, Broderick & Moller, 1998). Sustainable competitive advantage, it is argued, ought not to be based solely on the firm's assets and capabilities as advocated by the RBV of the firm which assumes that resources and capabilities are created through company history and are the results of learning processes and longer term accumulation of assets which cannot be changed in the short run (Hooley et al, 1998). A competitive advantage could only be sustained as long as customers consider it as an advantage.

By integrating the resource based view (internally focused) with market based view (externally focused), the firm's positioning strategy is linked with its resources and capabilities (Morgan, Strong & McGuiness, 2003). It is therefore concluded that competitive positions are created by matching the needs of the target customers with sustainable competitive advantages, achieved through a firm's resources and capabilities. The long term match between internal operations and external environment is the strategic fit. With strategic fit, operations make products which the customers want (satisfying market view) and are efficient (satisfying resource view) (Waters, 2006).

2.2.4 Competitive Priorities

Competitive priorities define the set of manufacturing objectives and represent the link to market requirements and manufacturing (Hayes & Wheelwright, 1984; Slack & Lewis, 2008). Several terms have been used to designate them; competitive priorities (Hayes & Wheelwright, 1984); manufacturing tasks (Skinner, 1969); objectives (Schroeder, Anderson & Cleveland, 1986); production competences (Cleveland et al., 1989) or manufacturing capabilities (Ferdows & De Meyer, 1990). Some studies suggest innovativeness and service as additional priorities (Boyer &

Lewis, 2002). However there is broad agreement on their composition. Hayes and Wheelwright (1984) summarized these as cost, quality, delivery and flexibility.

2.2.4.1 Trade – Offs Model

Skinner (1969, 1974) proposed the trade-off model in a series of conceptual studies. His work called for managers to choose their plant’s competitive priority, then design and operate the manufacturing system accordingly, concentrating efforts on developing assets and practices that help achieve their goals. Plants should focus on one priority at a time, because cost, flexibility, quality, and delivery capabilities require different operational structures and infrastructures for support (Skinner, 1969). This model proposes that companies must make choices regarding which competitive priorities should receive the greatest investment of time and resources. Companies are generally forced to make trade-offs between various priorities, based on their relative importance. Managers must choose a manufacturing priority, then allocate their scarce resources accordingly (Hayes & Wheelwright 1984). The underlying logic is that an operation cannot excel simultaneously on all competitive dimensions (Jacobs & Chase, 2008). Thus the decision by a firm to emphasize one performance dimension over another based on the recognition that superior performance on some dimensions may conflict with superior performance on others (Bozarth & Handfield, 2008).

It is worth noting, that some operations management scholars reject the concept of the trade-off. They point to the ability of some organizations to outperform their competitors on multiple dimensions. They appear to have better quality, greater dependability and a faster response to changing market conditions and lower costs (Barnes, 2008).

2.2.4.2 Cumulative Capabilities Model

Another model of competitive priorities is the cumulative capabilities model introduced by (Nakane, 1986, Ferdows & De Meyer, 1990). Ferdows and De Meyer (1990) extended this notion by arguing that certain operational capabilities enhance one another, enabling operations excellence to be built in a cumulative fashion. According to the model there are four competitive priorities: quality, dependability (of delivery), speed and cost. In their 'sandcone' model of operations excellence, they maintain that there is an ideal sequence in which operational capabilities should be developed. Ferdows and De Meyer (1990) stated that the development of cumulative and lasting manufacturing capability required management attention and resources and was a four step process starting with enhancing quality, then after a while the efforts to enhance qualify, then expanding attention to improve also the dependability of the production system, then-and again while efforts on the previous two are further enhanced-production flexibility (or reaction speed) should also be improved, and finally, while all these efforts are further enlarged, direct attention can be paid to cost efficiency. The idea is that one must first fully conform to quality requirements before focusing on dependability, then speed and finally cost. It is thus a cumulative model, where the present competitive priority is dependent on what has been achieved previously. Advocates of the cumulative model, however, claim that trade-offs are neither desirable nor necessary for two reasons. First, global competition has intensified the pressure on plants to improve along all four dimensions and secondly "World Class Manufacturers" set the standard, developing capabilities that reinforce one another (Boyer & Lewis, 2002).

2.2.4.3 Concept of Plant – within – Plant

One way that large facilities with multiple products can address the issue of trade-offs is using the concept of plant-within-a-plant (PWP). The factory focus literature draws on Skinner's (1974) work who proposed the idea that manufacturers have to learn to focus their plants (or even departments within plants) on a limited range of technologies, volumes, markets and products. The strategies, tactics and services should all be arranged to support that focus. The maxim was that a factory that succeeds in focusing its activities will out-perform one that does not. Costs would be lower than in unfocused operations due to the experience curve and scale benefits, consequently focus provides competitive advantage. In the last four decades, the focused factory concept by Skinner (1974) has evolved into the idea of flexible factories by Upton (1995) capable of responding quickly to changing environments. Surviving in today's highly competitive and rapidly changing environments often requires firms to develop strategies that provide the right kind of flexibility to succeed in their specific environments, thus achieving fit between the type of flexibility pursued and the demand placed by the environment.

2.2.5 Concept of Order Winners, Order Qualifiers and Delights

Hill (1985) presented the concept of order winners which was later joined by the concept of order qualifiers (Hill, 1995). These concepts have been expounded as follows; Order qualifying criteria (dimensions) are those that a firm must meet for the product to even be considered in the market place. Common criterions considered as order qualifiers include conformance quality and delivery reliability (Hill & Hill, 2009). Order winning criteria are dimensions that differentiate the manufacturer from its competitors and "win" the order. Although the concept of order winners and qualifiers provides a categorization and prioritization of competitive dimensions it gives a rather rough account. More precise is to rank requirements by relative weight and it has been suggested apportioning 100 points between requirements (Hill & Hill, 2009). In addition to order-winners and qualifiers, Slack and Lewis (2008) add a third category, generally known as 'delights'. Notwithstanding its rather off-putting name, delights are aspects of performance that customers have not yet been made aware of, or that are so novel that no one else is aware of.

2.2.6 Decision Categories

Decisions in manufacturing related issues are often grouped into categories, usually denoted decision categories. Skinner (1969) proposed that the key choice areas in manufacturing strategy consisted of plant and equipment, production planning and control, labour and staffing, product design and engineering, and organization and management. Hayes and Wheelwright (1984) expanded this list and proposed a basic set of eight decision categories; four structural areas i.e. capacity, facilities, technology and vertical integration/sourcing, and four infrastructural areas, i.e. workforce, organisation, quality, and production planning. Since Hayes and Wheelwright (1984) first presented the concept, numerous authors have contributed to the development and establishment of the set of decision categories and associated policy areas such as Voss (1995) who in the second paradigm introduced the concept of strategic choices in manufacturing. Slack and Lewis (2008) state that the operationalization of manufacturing strategy comes through a pattern of decisions within the manufacturing functions which determine resources to use, which practices to employ and emphasize in order to achieve the manufacturing objectives. This ultimately determines the manufacturing capabilities. However, it is a mistake to categorise decision areas as being either entirely structural or entirely infrastructural. In reality, all the decision areas have both structural and infrastructural implications (Slack & Lewis, 2008).

2.3 Measures of Performance

Measuring manufacturing performance is becoming an area of concern to manufacturers. In particular there is a need to understand how non-financial measures of performance are viewed in the manufacturing unit. Nanni, Miller and Vollmann (1988) have called for performance measures relating to the business strategy and the key improvement programs in manufacturing. The effectiveness of the manufacturing department should be measured by those factors it can chiefly affect (Vickery, Droge & Mackland, 1993). According to Vickery et al. (1993), they are volume flexibility, product mix flexibility, production cost, delivery lead time, delivery dependability, production lead time and product quality. Some of these contribute to cost-efficiency and some to responsiveness to customer demand, whereas many of them contribute to both.

The five performance objectives; quality, speed, dependability, flexibility and cost are really composites of many smaller measures and operational performance of a firm or organisation should be based on them (Slack & Lewis, 2008). For example, an operation's cost is derived from many factors, which could include the purchasing efficiency of the operation, the efficiency with which it converts materials, the productivity of its staff, the ratio of direct to indirect staff, and so on. All of these factors individually give a partial view of the operation's cost performance, and many of them overlap in terms of the information they include. Each of them does give a perspective on the cost performance of an operation, however, which could be useful either to identify areas for improvement or to monitor the extent of improvement (Slack & Lewis, 2008).

Table 2.3 shows some of the partial measures which can be used to judge an operation's performance.

Table 2.3 Some Typical Partial Measures of Performance

Performance objective	*Some typical measures*
Quality	Number of defects per unit
	Level of customer complaints
	Scrap level
	Warranty claims
	Mean time between failures
	Customer satisfaction score
Speed	Customer query time
	Order lead-time
	Frequency of delivery
	Actual versus theoretical throughput time
	Cycle time
Dependability	Percentage of orders delivered late
	Average lateness of orders
	Proportion of products in stock
	Mean deviation from promised arrival
	Schedule adherence
Flexibility	Time needed to develop new products/services
	Range of products/services
	Machine change – over time
	Average batch size
	Time to increase activity rate
	Average capacity/maximum capacity
	Time to change schedules
Cost	Minimum delivery time/average delivery time
	Variance against budget
	Utilisation of resources
	Labour productivity
	Added value
	Efficiency
	Cost per operation hour

Note. Some typical partial measures of performance. Adapted from *Operations Strategy* (p.176), by Slack and Lewis, 2008, Harlow, England: Financial Times Prentice Hall. Copyright 2008 by Nigel Slack and Micheal Lewis. Adapted with permission.

2.4 Summary of Empirical Literature Review

Skinner's (1969) initial arguments led to a number of research papers on manufacturing strategy and the concept of manufacturing strategy began to gain the attention of researchers. Some of the initial studies sought to develop further the need to recognize the competitive advantage that manufacturing strategy provides (Hayes & Wheelwright, 1984). Along these lines, there have been empirical studies aimed at providing support that indeed manufacturing strategy can contribute to a firm's competitive strength (Swamidass & Newell, 1987; Ward & Duray, 2000).

Other empirical studies aimed at providing support that manufacturing strategy contributes to business performance include Tunalv (1992) who researched on the existence of manufacturing strategy and business in 184 swedish companies and found companies possessing production strategy have a higher return on sales ratio. The study were based on the manufacturing futures survey.

There have been studies which have examined trade-off studies and looked at the need for plants to prioritize their strategic objectives and devote resources to improving those manufacturing capabilities. For example, researchers frequently claim that plants must make choices between achieving low costs or high flexibility (Hayes & Wheelwright 1984). Some of these studies include Barnes (2008) and found that some organizations outperform their competitors on multiple dimensions. Others like, Ferdows and De Meyer (1990) examined the effect of production programs on production performance in 14 European countries. Their sample of 187 European manufacturers lent some support to the cumulative capabilities model, depicting the cumulative effect of quality. Studies by Roth and Miller (1992) and Noble (1995) also suggest that priorities are positively correlated and that high-performing plants are more likely to compete on multiple dimensions. Boyer and Lewis (2002) analyzed data collected from 110 plants that had implemented advanced manufacturing technology and found that trade-offs remained even though perceived differences in competitive priorities were subtle and may vary across levels of plant hierarchy and that plants increasingly considered all four manufacturing capabilities vital for competitive success. While several empirical studies such as Ferdows and De Meyer (1990) failed to find the expected negative correlations between the competitive dimensions, some cross-sectional studies such as Boyer and Lewis (2002) did find evidence supporting the classical tradeoffs model.

Demeter (2003) studied the existence of manufacturing strategy contribution to company level competitiveness (ROS, inventory turnover) based on international data, which were collected in the second round of the International Manufacturing Strategy Survey. The results partially showed that the existence of manufacturing strategy seemed to have a positive effect on ROS, however, it did not have any relation to inventory turnover.

Avella, Fernandez and Vazquez (2001) focused on analyzing the growing importance of manufacturing strategies for the competitiveness of firms. The aim of their research work was to analyze whether or not there existed a correlation between the manufacturing strategy and the competitive success or business performance of a sample of large Spanish industrial firms. The results obtained revealed that it is not possible to identify a direct relationship between the manufacturing strategy and business performance of the sample of firms analyzed.

Schroeder, Bates and Junttila (2002) examined manufacturing strategy from the perspective of the resource based view of the firm. Based on data from 164 manufacturing plants, they demonstrated that competitive advantage as measured by superior plant performance resulted from proprietary processes and equipment which in turn were driven by external and internal learning.

Most of the research has been confined to well-developed economies. Amoako-Gyampah (2003) researched on the relationships among selected business environment factors and manufacturing strategy among manufacturing firms in Ghana and demonstrated that in an emerging economy concerns about the competitive hostility is the factor with the strongest influence on manufacturing strategy choice.

Meroka and Nyamwange (2003) researched the manufacturing strategies pursued by the large manufacturing firms in Kenya indicated that presence of trade-offs on one hand and order-winners and qualifiers on the other was found that all firms, regardless of company characteristics. The findings of this research indicated the majority of large manufacturing firms acknowledged that operations based strategies enhanced the competitive capabilities of their firms by contributing to long-term business performance and success. In order to mobilize their competitiveness, firms need to emphasize high quality and consistence, low cost and hence low price, time/speed, dependability, innovativeness and high flexibility.

In summary mixed findings have been made from previous empirical studies especially those ones that were conducted in the developed world particularly America and Europe. More so, few studies have been conducted so far on the Kenyan business environment. Adoption of manufacturing strategy and proper implementation could lead to improved business performance and competitiveness.

CHAPTER THREE: RESEARCH METHODOLOGY

3.1 Introduction

This chapter presents the ways and methods that were used to gather, analyze and present the required data about the research questions and objectives. It includes research design, population, data collection and analysis.

3.2 Research Design

A research design is the arrangement of conditions for collection and analysis of data in a manner that aims to combine relevance to the research purpose with economy in procedure (Kothari, 2004). Research design is the plan and structure of investigation so conceived as to obtain answers to research questions. The plan is the overall scheme or program of the research. It includes an outline of what the investigator will do from writing hypotheses and their operational implications to the final analysis of data (Cooper & Schindler, 2008). In fact, the research design is the conceptual structure within which research is conducted and constitutes the blueprint for the collection, measurement and analysis of data.

A descriptive study was undertaken for the research. A descriptive study is undertaken in order to ascertain and be able to describe the characteristics of variables of interest in a situation. Descriptive studies are undertaken in order to describe the characteristics of organizations that follow common practices (Sekaran, 2003). Descriptive studies are conducted after the researcher has gained a firm grasp of the situation being studied. This understanding, which may have been developed in part from exploratory research, directs the study toward specific issues (Zikmund, Babin, Carr & Griffin, 2008).

3.3 Population

The population of the research was derived from all 71 firms in the metals & allied sector (Appendix III), derived from the Kenya Manufacturers & Exporters Directory (KAM, 2013). No sample design was required as the research design was a census study. A census study was necessitated by the relatively small size of the population.

3.4 Data Collection Methods and Instruments

Primary data was collected by means of a self-administered questionnaire (Appendix I) which consisted of both open and close-ended questions. The questionnaire was administered to the respondent's through delivery by hand/postal services. Self-addressed envelopes were enclosed for the convenience of the respondents. The 'drop and pick later' method was used to pick the filled questionnaires delivered by hand. For firms with functional websites the questionnaires were sent with a return email address.

The questionnaire consisted of four sections that collected the respondent's responses through a five point Likert scale. Section A gathered demographic data about the firm, the expected respondents, size of the firm and length of time the firm has been in operation. Section B gathered information on the formality of manufacturing strategy process, participants in formulation process, the competitive priorities (measured the manufacturing strategies used) and structural/infra-structural decisions. The questionnaire part to measure the disaggregated competitive dimensions (Priorities) was party adopted from the manufacturing futures survey which has been successfully used by scholars such as (Ferdows & De Meyer, 1990). Section C collected data on factors that have led or influenced the firms to adopt manufacturing strategies. Finally section D collected data pertaining to how manufacturing strategy was related to operational performance. Operational performance measures such as scrap and rework, cost per hour, number of customer complaints and number of defects per unit were used.

The study targeted operations managers or their equivalents, who had considerable experience in operations (manufacturing) functions of the manufacturing firms. This was aimed at ensuring accuracy and authenticity of the information collected for the study.

3.5 Data Analysis

Processing of data involved editing, coding, classification, tabulation and use of percentages. Analysis of data was uni-dimensional and mainly interpreted using descriptive statistics involving measures of central tendency and dispersion. The data was analyzed using IBM SPSS Statistics version 21.

Section A was analyzed using descriptive statistics such as frequency distribution to give overall picture about the firms and respondents; section B was analyzed using descriptive statistics; section C was analyzed using descriptive statistics and factor analysis and section D was analyzed by multiple regression analysis to determine the relationship between manufacturing strategy and operational performance. Multiple regression analysis is a general statistical technique used to analyze the relationship between the dependent variable (response) and several independent predictor variables (Hair, Black, Babin, & Anderson, 2010). Manufacturing strategy measures based on the competitive priorities were the independent variables (Predictors), while operational performance measures were the dependent variable (response). The model took the general form:

$$\boldsymbol{y} = \boldsymbol{\beta}_0 + \boldsymbol{\beta}_1\boldsymbol{x}_1 + \boldsymbol{\beta}_2\boldsymbol{x}_2 + \cdots + \boldsymbol{\beta}_n\boldsymbol{x}_n + \boldsymbol{\varepsilon}$$

Where:

y = predicted score of response (dependent) variables {y = 1, 2, 3…23}

β_0 = Regression constant (Intercept)

β_1, β_2… β_n = Unstandardized regression coefficients for manufacturing strategy variables

X_1, X_2, X_3… X_n = scores of predictors i.e. manufacturing strategy variables

n:= number of Predictors in model

ε = Residual (Error term)

Based on the above, regression models were developed to investigate the relationship between manufacturing strategy and operational performance for each measure of the dependent variable. Operationalization of the research variables is detailed in appendix II.

The researcher used F- Test to test for the overall significance of the models.

CHAPTER FOUR: DATA ANALYSIS, RESULTS AND DISCUSSION

4.1 Introduction

This chapter presents the research findings. It further presents the data analysis, results, presentation and discussion of the findings. Out of a target population of 71 respondent firms in the metal and allied sector, 38 usable questionnaires were received and analyzed, indicating a response rate of 53.5%.

The chapter covers the demographics of the respondent companies which are analysed using descriptive statistics such as frequency distributions, Manufacturing strategies are analysed using descriptive statistics to determine formality, participation, competitive priorities and decisions relating to design of process and infrastructure, Descriptive and factor analysis was used to examine the factors leading to adoption of manufacturing strategies & multiple regression analysis applied to examine the relationship between manufacturing strategy and operational performance.

4.2 Firm Demographics

The study sought some background information relating to the topic under investigation on the firms in the metal and allied sector in Kenya. The number of employees and the duration of firm operation since start-up were relevant to the study.

The respondents in the respective firms in the metal and allied sector were asked to state the number of employees in their respective firms. This was done so as to find out whether these firms have a sizeable number of employees that would determine the application of the topic under investigation. This was a close ended question that gave the respondents the opportunity to tick the category with the number of employees. The results were displayed as per table 4.2.1

Table 4.2.1 Response to the Number of Employees

Number of Employees	Frequency	Percent	Cumulative Percent
5-100	4	10.5	10.5
101-500	16	42.1	52.6
501-1000	14	36.8	89.5
More than 1000	4	10.5	100.0
Total	38	100.0	

Source: Research Data

From the findings in Table 4.2.1, 89.5 percent of the surveyed firms had over 100 employees with 4 firms having over 1000 employees. This is may be an indicator to the relatively labour intensive manufacturing processes utilized by the firms in the metals and allied sector.

Table 4.2.2 Response to Duration of Firm Operation

Duration of Firm Operation	Frequency	Percent	Cumulative Percent
Less than 5 Years	3	7.9	7.9
Between 5 and 10 Years	17	44.7	52.6
Between 11 and 20 Years	11	28.9	81.6
Over 20 Years	7	18.4	100.0
Total	38	100.0	

Source: Research Data

The respondents were asked to indicate the length of time in years their respective firms have been in operation. They were asked to tick the check boxes of less than 5 years, 5 to 10 years, 11 to 20 years, and over 20 years. The study sought to know the duration in years the firms have been in operation so as to ensure that the study involved firms which have been in operation for a considerable length of time. The findings are displayed in Table 4.2.2.

The findings as displayed in Table 4.2.2 show that 92.1% of the manufacturing firms had been in operation for over 5 years. This indicates that the targeted population was resourceful in ensuring accuracy and authenticity of the information provided for the study.

4.3 Formality of Strategy Formulation Process

The study sought to determine which manufacturing strategies firms in the metals and allied sector used. The respondents were asked to state the nature of strategy making process in the organization. The nature was pre-categorized as formal, partially formal and informal.

Table 4.3.1 Response on the Formality of the Strategy Making Process

Formality of strategy making process	Frequency	Percent	Cumulative Percent
Formal	22	57.9	57.9
Partially formal	10	26.3	84.2
Informal	6	15.8	100
Total	38	100	

Source: Research Data

From the findings in table 4.3.1, 22 of the respondents representing 57.9 percent of the total agreed that strategy formulation was formal, 10 agreed that it was partially informal and 6 of the respondents representing 15.8 percent of the total respondents agreed that the process was informal in their respective organizations. In summary, 84.2 percent or 32 out of 38 respondents agreed that the strategy formulation process had elements of formality.

4.4 Involvement in Manufacturing Strategy Formulation Process

The respondents were asked to rate their responses on a scale of 1 to 5 on how they agreed with the extent of involvement of certain groups in the manufacturing strategy formulation process. The scale ranged from 1 (not involved at all) to 5 (highly involved). Five groups which are involved in manufacturing strategy formulation in the manufacturing firms were subjected to analysis using descriptive analysis.

Table 4.4.1 Response on Participation in Strategy making Process

		Not involved at all	Involved to a Small Extent	Medium Involved	Involved to a High Extent	Highly Involved	Total
Board of Directors involvement	Frequency	15	11	7	3	2	38
	Percent	39.5	28.9	18.4	7.9	5.3	100.0
	Cumulative Percent	39.5	68.4	86.8	94.7	100.0	
Chief Executive Officer	Frequency	4	8	15	8	3	38
	Percent	10.5	21.1	39.5	21.1	7.9	100.0
	Cumulative Percent	10.5	31.6	71.1	92.1	100.0	

Middle Managers	Frequency	7	2	11	8	10	38
	Percent	18.4	5.3	28.9	21.1	26.3	100.0
	Cumulative Percent	18.4	23.7	52.6	73.7	100.0	
Line Managers	Frequency	6	12	11	5	4	38
	Percent	15.8	31.6	28.9	13.2	10.5	100.0
	Cumulative Percent	15.8	47.4	76.3	89.5	100.0	
Consultants	Frequency	16	9	6	6	1	38
	Percent	42.1	23.7	15.8	15.8	2.6	100.0
	Cumulative Percent	42.1	65.8	81.6	97.4	100.0	

Source: Research Data

The findings as shown in table 4.4.1 reveal that:-

Only 5.3 percent of the respondents agreed that the board of directors is highly involved, 7.9 percent agreed that the board of directors is involved to a high extent, 18.4 percent are medium involved, 28.9 percent involved to a small extent and 39.5 percent said that the board of directors are not involved at all. In summary, 23 out of 38 respondents accounting for 60.5 percent agreed that the board of directors had some role or involvement in the strategy making process; That only 3 (7.9 percent) of the respondents agreed that the CEO and top management are highly involved, 8 (21.1 percent) agreed that the they are involved to a high extent, 15 (39.5 percent) agreed that they are medium involved, 8 (21.1 percent) agreed that they are involved to a small extent and 4

(10.5 percent) said that the CEO is not involved at all. In summary, 34 out of 38 respondents accounting for 89.5 percent agreed that the CEO had some role or involvement in the strategy making process; That 10 (26.3 percent) of the respondents agreed that the middle managers are highly involved, 8 (21.1 percent) agreed that the they are involved to a high extent, 11 (28.9 percent) agreed that they are medium involved, 2 (5.3 percent) agreed that they are involved to a small extent and 7 (18.4 percent) said that the middle are not involved at all. In summary, 31 out of 38 respondents accounting for 81.6 percent agreed that the middle managers had some role or involvement in the strategy making process; That 4 (10.5 percent) of the respondents agreed that the Line managers are highly involved, 5 (13.2 percent) agreed that the they are involved to a high extent, 11 (28.9 percent) agreed that they are medium involved, 12 (31.6 percent) agreed that they are involved to a small extent and 6 (15.8 percent) said that the line managers are not involved at all. In summary, 32 out of 38 respondents accounting for 84.2 percent agreed that the line managers had some role or involvement in the strategy making process; That only 1 (2.6 percent) of the respondents agreed that consultants are highly involved, 6 (15.6 percent) agreed that they are involved to a high extent, 6 (15.6 percent) agreed that they are medium involved, 9 (23.7 percent) agreed that they are involved to a small extent and 16 (42.1 percent) agreed that the consultants are not involved at all. In summary, 22 out of 38 respondents accounting for 57.9 percent agreed that consultants had some role or involvement in the strategy making process.

4.5 Manufacturing Strategies

This section discusses competitive priorities which were used to determine the manufacturing strategies used by the firms. In total, 22 items (measures) were grouped into four factors representing the competitive priorities (Quality, Cost, Flexibility and Delivery) and were subjected to ranking where a Likert type of scale was used and ranged from 1 (no emphasis) to 5 (extreme emphasis).

Table 4.5.1 Competitive Priority Cost

	N	Std. Deviation	Variance	Mean
Reduce unit costs	38	1.155	1.335	3.55
Reduce material costs	38	1.597	2.550	3.13
Reduce overhead costs	38	1.052	1.107	3.97
Reduce inventory level	38	1.050	1.102	3.08
Average mean	38	.79304	.629	3.4474
Valid N (listwise)	38			

Source: Research Data

The results from descriptive statistics presented in table 4.5.1 reveal that from the four questionnaire items, the respondent's ranked overhead costs and unit costs high in priority as they had means of 3.97 and 3.55 respectively. Reduction in material costs ranked third in importance with a mean of 3.13 and inventory level reduction had the least emphasis with a mean of 3.08. The respondents strongly agreed that reductions in overhead cost, unit cost, material costs and inventory level reduction were manufacturing strategies which would result in competitive advantage in terms of cost.

Table 4.5.2 Competitive Priority Quality

	N	Variance	Std. Deviation	Mean
Ability to offer consistent quality with low defects	38	.254	.504	4.55
Improve product performance and reliability	38	1.534	1.239	3.92
Improve vendor's quality	38	1.821	1.349	3.26
Implement quality control circles	33	.780	.883	3.97
Obtaining ISO 9000 certification	38	1.096	1.047	3.66
Ability to provide durable products	38	1.671	1.293	3.71
Average mean	38	.647	.80454	3.8289
Valid N (listwise)	38			

Source: Research Data

The results from descriptive statistics presented in table 4.5.2 reveal that out of the six items used to evaluate the quality competitive priority, the respondent's ranked consistent quality with low defects high in priority as it had a mean of 4.55. Implement quality control circles ranked second in importance with a mean of 3.97. Product performance reliability ranked third in importance with a mean of 3.92. There was marginal difference between ability to provide durable products and ISO 9000 certification. Improve vendor or supplier quality ranked last with a mean of 3.26.

The respondents strongly agreed that the six items were manufacturing strategies that would result in quality leadership.

Table 4.5.3 Competitive Priority Flexibility

	N	Variance	Std. Deviation	Mean
Reduce manufacturing lead-time	38	.595	.771	4.00
Reduce procurement lead-time	38	.695	.834	3.18
Reduce new product development cycle	38	1.212	1.101	2.37
Reducing setup/changeover time	38	.623	.789	3.84
Ability to customize products to customer needs	38	.982	.991	3.21
Ability to offer a broad product line	38	.905	.952	3.50
Ability to make rapid product mix changes	38	1.984	1.408	3.55
Ability to make rapid volume changes	38	1.644	1.282	3.37
Average mean	38	.491	.70080	3.3783
Valid N (listwise)	38			

Source: Research Data

The results from descriptive statistics presented in table 4.5.3 reveal that out of the eight questionnaire items used to evaluate the flexibility competitive priority, the respondent's ranked reduction in manufacturing lead-time high with a mean of 4.00. Reducing setup/changeover time ranked second in importance with a mean of 3.84.

However, the respondents were neither agreeable nor disagreeable on reduction of new product development cycles as a manufacturing strategy worth pursuing.

Table 4.5.4 Competitive Priority Delivery

	N	Std. Deviation	Variance	Mean
Increase delivery reliability	38	.755	.570	4.39
Increase delivery speed	38	.944	.891	3.97
Improve pre-sales service and technical support	38	1.234	1.523	3.13
Improve after sales service	38	1.010	1.019	3.82
Average mean	38	.76473	.585	3.8289
Valid N (listwise)	38			

Source: Research Data

The results from descriptive statistics presented in table 4.5.4 reveal that out of the four questionnaire items used to evaluate the delivery competitive priority, the respondent's ranked delivery reliability high with a mean of 4.39. Delivery speed ranked second in importance with a mean of 3.97 while after sales service was third with a mean of 3.82. Improve pre-sales service and technical support was last with a mean of 3.13.

The respondents strongly agreed that improving delivery reliability, improving delivery speed, improving after sales service and improving pre-sales service and technical support were manufacturing strategies that would give the firms deliver in time and gain competitive advantage.

Table 4.5.5 Comparison of Competitive Priorities

Competitive Priority	Questionnaire Items (Numbers)	Std. Deviation	Average Mean
Cost	4	.79304	3.4474
Quality	6	.80454	3.8289
Flexibility	8	.70080	3.3783
Delivery	4	.76473	3.8289

Source: Research Data

The results from descriptive statistics presented in table 4.5.5 reveal that the respondent's ranked quality and delivery high with a means of 3.83 respectively. Cost ranked third in importance with a mean of 3.45 while Flexibility was last with a mean of 3.38.

The results show that firms in the metals and allied sector view cost as a significant competitive dimension hence the focus to attempt and control it. The analysis indicated some difference between cost, quality, flexibility and delivery dimensions suggesting that trade – offs between the four dimensions were present and the firms could be competing on multiple dimensions i.e. cost and delivery.

4.6 Decisions relating to the Design of Process and Infrastructure

This section discusses the decisions relating to the design of process and the infrastructure involved to support manufacturing. In total, 8 factors were subjected to ranking and a Likert type of scale was used, with the highest critical decision (Highly Important) scoring (5) points, whereas that with least important (Not Important) scored (1) point. The mean and standard deviation scores were computed as shown in the table 4.6.1.

Table 4.6.1 Decisions in Design of Process and Infrastructure

		Mean	Standard deviation
1	Sustainable competitive advantage and continuous improvement	4.24	0.675
2	Quality assurance and control approaches	4.13	0.875
3	Capacity	4.11	0.924
4	Facilities (Size and Location)	3.82	0.865
5	Process Technology	3.82	1.159
6	Planning and Control systems	3.79	1.318
7	Work organization	3.61	1.198
8	Supply Network	3.24	1.125

Source: Research Data

Results from descriptive statistics presented in table 4.6.1 showed that the respondents indicated the need to have a sustainable competitive advantage and continuous improvement as a strong reason in decisions relating to design of process and infrastructure as it had the highest scored indicator with a mean score of 4.24. The need to ensure quality assurance and control approaches in the manufacturing firms in the metal and allied sector followed with a mean score of 4.13. The next ranked factor was capacity with a mean of 4.11. The next ranked component decision was facilities in terms of size and location, and process technology with mean scores of 3.82 each respectively. The least ranked in terms of importance on the design of process and infrastructure were work organization and supply network with mean scores of 3.61 and 3.24 respectively.

The respondents strongly agreed that the firms must choose its process and design its infrastructure that is consistent with the existing ways the products win orders so as to have a sustainable competitive advantage and also be able to implement best practices in areas such as quality control, while being able to reflect future developments in line with changing business requirements.

4.7 Factors leading to Adoption of Manufacturing Strategies

This section gives the findings on the factors leading to the adoption of manufacturing strategies in the metal and allied sector. In total, 10 factors were subjected to ranking and a Likert type of scale was used and ranged from1 (not influential) to 5 (Highly influential). The mean and standard deviation scores were computed as shown in the table 4.7.1.

Table 4.7.1 Factors leading to Adoption of Manufacturing Strategies

	Factors leading to adoption of manufacturing strategies	Mean	Standard deviation
1	Continuous Improvement	4.47	0.797
2	Increased Competition	4.34	0.878
3	Innovation Orientation (New Products)	4.26	1.032
4	Need to Focus on Customers	4.13	0.991
5	Need to be the best in class (World Class)	3.97	0.915
6	Environmental Dynamism (factors beyond control)	3.79	1.212
7	Manufacturing Capabilities	3.61	1.198
8	Resource Orientation (tangible & intangible)	3.24	0.913
9	Financial Reasons	3.05	1.161
10	Product Dimension	3.00	1.294

Source: Research Data

Results from descriptive statistics presented in table 4.7.1 showed that among the factors leading to the adoption of manufacturing strategies in the metal and allied sector, the need for continuous improvement was the highest with a mean score of 4.47 and was followed by increased competition with a mean of 4.34. The next ranked factors were; innovation orientation, need to focus on customers and need to be the best in class with mean scores of 4.26, 4.13, and 3.97 respectively. The least ranked factors that drive the adoption of manufacturing strategies were resource orientation (tangible and intangible), financial reasons and product dimension with mean scores of 3.24, 3.05 and 3.00 respectively.

Further analysis was conducted to determine which strategic factors loaded to form common components. To achieve this objective, factor analysis was carried out (using SPSS). Four broad categories of components were identified after seven (7) iterations. Table 4.7.2 shows the four classes and the respective measures in each class.

Table 4.7.2 Factors Analysis

	Factor loadings	Sum of factor loadings
Component One		
Environmental Dynamism (factors beyond control)	0.714	
Resource Orientation (tangible & intangible)	0.624	2.045
Increased competition	0.558	
Product Dimension	0.149	
Component Two		
Need to focus on customers	0.700	1.048
Innovation Orientation	0.348	
Component Three		
Financial Reasons	0.847	1.623
Manufacturing Capabilities	0.776	
Component Four		
Need to be the best (World Class)	0.617	1.232
Continuous Improvement	0.615	

Source: Research Data

From the analysis measures, component one had the highest factor loading of 2.045 followed by component three with factor loadings of 1.623, component four had a factor loading of 1.232 respectively. Least loadings were reported on component two with factor loading of 1.048. Component one groups to form a competitive based strategy. Component two groups to form a customer focused strategy. Component three groups to represent internal capability strategy and finally component four groups to form manufacturing excellence strategy.

4.8 Relationship between Manufacturing Strategy and Operational Performance

Multiple linear regression analysis was conducted to investigate the relationship between manufacturing strategy and operational performance. Manufacturing strategy predictors were the independent variables, while operational performance measures were the dependent variables.

Table 4.8.1 Model Summary: Manufacturing Strategy and Operational Performance

Operational Performance Measure	R	R Square	Adjusted R Square	Std. Error of the Estimate
Time needed to develop new Products	.906[a]	.821	.772	.368
Range of Products or Services	.884[a]	.782	.721	.397
Machine change over time	.916[a]	.838	.794	.420
Average capacity or Maximum Capacity	.905[a]	.820	.770	.424
Time to change schedules	.928[a]	.862	.823	.381
Utilization of Resources	.831[a]	.691	.654	.463

Labour Productivity	.934[a]	.872	.856	.411
Added Value	.738[a]	.544	.489	.366
Efficiency	.960[a]	.921	.912	.310
Cost per hour	.768[a]	.589	.539	.799
Number of defects per unit	.660[a]	.436	.306	1.117
Level or Number of Customer Complaints	.706[a]	.499	.383	1.029
Customer satisfaction index	.984[a]	.968	.960	.177
Warranty claims	.958[a]	.917	.894	.390
Prime first time quality yield	.951[a]	.905	.883	.284
Scrap & Rework	.893[a]	.797	.750	.558
Mean time before repair	.886[a]	.785	.736	.436
Order lead time	.960[a]	.922	.913	.392
% of products on time in full	.872[a]	.761	.732	.472
Actual versus theoretical throughput time	.907[a]	.822	.801	.377
Manufacturing cycle time	.679[a]	.460	.395	.563
Percentage of orders delivered late	.795[a]	.632	.587	.824
Schedule adherence	.904[a]	.817	.795	.341

Source: Research Data

Table 4.8.1 shows the model summary from the regression analysis for the twenty three operational performance measures. The correlation coefficient (R) is a Pearson correlation between predicted values and actual values of dependent variable. The sign (+or -) indicates the direction of the relationship. The value can range from +1 to -1, with +1 indicating a perfect positive relationship, 0 indicating no relationship and -1 indicating a perfect negative or reverse relationship (Hair et al., 2010). In this case the multiple correlation coefficients ranged from 0.660 to 0.960 indicated strong relationships between the set of independent and dependent variables.

The coefficient of determination (R square) measures the proportion of the variance of the dependent variable about its mean that is explained by the independent, or predictor, variables (Hair et al., 2010). According to results in table 4.8.1, the values of R Square for the twenty three measures of operational performance ranged from 0.436 to 0.921, indicating that 43.6% to 92.1% of the variance in operational performance of firms in the metals and allied sector was explained by the measures of manufacturing strategy. However since R Square values ranged from 0.436 to 0.921, there was still some unexplained variation indicating room for improvement.

The adjusted multiple coefficient of determination ranged from 0.306 to 0.913. If a variable is added to the model, R Square becomes larger even if the variable added is not statistically significant. The adjusted multiple coefficient of determination compensates for the number of independent variables in the model.

The above measures give an overall measure of the strength of association and do not reflect the extent to which any particular independent variable is associated with the dependent variable.

Table 4.8.2 ANOVA: Manufacturing Strategy and Operational Performance

Operational Performance measure		Sum of Squares	df	Mean Square	F	Sig.
Time needed to develop new Products	Regression	18.067	8	2.258	16.652	.000[b]
	Residual	3.933	29	.136		
	Total	22.000	37			
Range of Product or Services	Regression	16.394	8	2.049	12.976	.000[b]
	Residual	4.580	29	.158		
	Total	20.974	37			
Machine Change-Over time	Regression	26.471	8	3.309	18.785	.000[b]
	Residual	5.108	29	.176		
	Total	31.579	37			
Average capacity or Maximum capacity	Regression	23.664	8	2.958	16.481	.000[b]
	Residual	5.205	29	.179		
	Total	28.868	37			
Time to Change Schedules	Regression	26.141	8	3.268	22.553	.000[b]
	Residual	4.202	29	.145		
	Total	30.342	37			
Utilization of Resources	Regression	15.804	4	3.951	18.455	.000[b]
	Residual	7.065	33	.214		
	Total	22.868	37			
Labour Productivity	Regression	37.796	4	9.449	55.952	.000[b]
	Residual	5.573	33	.169		
	Total	43.368	37			
Added Value	Regression	5.287	4	1.322	9.860	.000[b]
	Residual	4.424	33	.134		
	Total	9.711	37			
Efficiency	Regression	37.161	4	9.290	96.373	.000[b]
	Residual	3.181	33	.096		
	Total	40.342	37			
Cost per hour	Regression	30.203	4	7.551	11.831	.000[b]
	Residual	21.060	33	.638		
	Total	51.263	37			
Number of Defects per unit	Regression	25.091	6	4.182	3.353	.014[b]
	Residual	32.424	26	1.247		
	Total	57.515	32			

Level or Number of Customer Complaints	Regression Residual Total	27.400 27.509 54.909	6 26 32	4.567 1.058	4.316	.004[b]
Customer satisfaction score (index)	Regression Residual Total	24.696 .819 25.515	6 26 32	4.116 .032	130.647	.000[b]
Warranty claims	Regression Residual Total	35.514 3.200 38.714	6 21 27	5.919 .152	38.844	.000[b]
Prime First time Quality yield	Regression Residual Total	19.904 2.096 22.000	6 26 32	3.317 .081	41.144	.000[b]
Scrap and rework	Regression Residual Total	31.795 8.084 39.879	6 26 32	5.299 .311	17.043	.000[b]
Mean Time before repair	Regression Residual Total	18.035 4.935 22.970	6 26 32	3.006 .190	15.837	.000[b]
Order Lead Time	Regression Residual Total	59.980 5.073 65.053	4 33 37	14.995 .154	97.545	.000[b]
% of products on time and in full	Regression Residual Total	23.402 7.361 30.763	4 33 37	5.850 .223	26.227	.000[b]
Actual versus theoretical throughput time	Regression Residual Total	21.663 4.679 26.342	4 33 37	5.416 .142	38.193	.000[b]
Manufacturing Cycle Times	Regression Residual Total	8.917 10.452 19.368	4 33 37	2.229 .317	7.038	.000[b]
Percentage of orders delivered late	Regression Residual Total	38.451 22.391 60.842	4 33 37	9.613 .679	14.168	.000[b]
Schedule Adherence	Regression Residual Total	17.231 3.848 21.079	4 33 37	4.308 .117	36.938	.000[b]

Source: Research Data

Table 4.8.2 shows the analysis of variance of the regression results from the twenty three models used to determine if there existed a relationship between manufacturing strategy and operational performance. Further analysis using F statistics was done to test if the predictor variables had a statistically significant relationship with the outcome/response variable. The test of significance for the F-statistic measures the probability that none of the independent variables in the model are correlated with the dependent variable beyond what could be explained by pure chance (due to random sampling error).

As mentioned, the F test is used to test the significance of the regression model as a whole. The null hypothesis (that all population regression coefficients are 0 simultaneously) is rejected if the F ratio is large.

The general form of this hypotheses test is:-

H_0: $\beta_1 = \beta_2 = \beta_3 \ldots \beta_n = 0$

H_A: H_0 is not true

We adhere to the following decision rule:

Reject H_0 if, F > FC, where FC is the critical value of F at 5% level of significance (α=0.05) and its values were obtained from tables.

The results of the F-test for the above models are summarized in table 4.8.3 below:-

Table 4.8.3 Results of F-Test Significance Analysis

	Critical value of F (FC)	Calculated value of F	Result	Conclusion
For time needed to develop new products	$F_{8,29} = 2.29$	16.652	16.652 > 2.29	Reject null hypotheses
Range of products or services	$F_{8,29} = 2.29$	12.976	12.976 > 2.29	Reject null hypotheses
Machine change-over time	$F_{8,29} = 2.29$	18.785	18.785 > 2.29	Reject null hypotheses

Average capacity or Maximum capacity	$F_{8,29} = 2.29$	16.481	16.481 > 2.29	Reject null hypotheses
Time to change schedules	$F_{8,29} = 2.29$	22.553	22.553 > 2.29	Reject null hypotheses
Utilization of resources	$F_{4,33} = 2.66$	18.455	18.455 > 2.66	Reject null hypotheses
Labour Productivity	$F_{4,33} = 2.66$	55.952	55.952 > 2.66	Reject null hypotheses
Added Value	$F_{4,33} = 2.66$	9.860	9.860 > 2.66	Reject null hypotheses
Efficiency	$F_{4,33} = 2.66$	96.373	96.373 > 2.66	Reject null hypotheses
Cost per hour	$F_{4,33} = 2.66$	11.831	11.831 > 2.66	Reject null hypotheses
Number of defects per unit	$F_{6,26} = 2.47$	3.353	3.353 > 2.66	Reject null hypotheses
Level or number of customer complaints	$F_{6,26} = 2.47$	4.316	4.316 > 2.66	Reject null hypotheses
Customer satisfaction score (index)	$F_{6,26} = 2.47$	130.647	130.647 > 2.66	Reject null hypotheses
Warranty claims	$F_{6,21} = 2.57$	38.844	38.844 > 2.57	Reject null hypotheses
Prime first time quality yield	$F_{6,26} = 2.47$	41.144	41.144 > 2.66	Reject null hypotheses
Scrap & Rework	$F_{6,26} = 2.47$	17.043	17.043 > 2.66	Reject null hypotheses
Mean time before repair	$F_{6,26} = 2.47$	15.837	15.837 > 2.66	Reject null hypotheses
Order lead time	$F_{4,33} = 2.66$	97.545	97.545 > 2.66	Reject null hypotheses
% of products on time and in full	$F_{4,33} = 2.66$	26.227	26.227 > 2.66	Reject null hypotheses
Actual versus theoretical throughput time	$F_{4,33} = 2.66$	38.193	38.193 > 2.66	Reject null hypotheses
Manufacturing cycle time	$F_{4,33} = 2.66$	7.038	7.038 > 2.66	Reject null hypotheses
Percentage of orders delivered late	$F_{4,33} = 2.66$	14.168	14.168 > 2.66	Reject null hypotheses
Schedule adherence	$F_{4,33} = 2.66$	36.938	36.938 > 2.66	Reject null hypotheses

Source: Research Data

In conclusion, the significant F value, F calculated > F critical, $p < .05$, indicates that there are statistically significant relationships between predictors and responses in the regression models.

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CHAPTER FIVE: SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

In this chapter the summary of the study findings is covered, conclusions of the study, recommendations of the study, limitations of the study as well as suggestions for further research.

5.2 Summary

A descriptive research based on census research design was conducted to establish the relationship between manufacturing strategy and operational performance within the metal & allied sector in Kenya using data from 38 manufacturing firms in the metals and allied sector. The study had three objectives; to determine the manufacturing strategies adopted, to establish the factors that are critical to the selection of manufacturing strategies and examine whether there exists a relationship between manufacturing strategy and operational performance.

Descriptive statistics was used to evaluate and determine the manufacturing strategies in terms of formality of the strategy formulation process, participation in the process, the manufacturing strategies in use and key decisions relating to the design of process and infrastructure. A set of manufacturing strategy measures were regressed against operational performance indicators to evaluate the influence of the former on the latter. A multiple regression model was used to evaluate the overall relationship between manufacturing strategy and operational performance.

Results of descriptive statistics showed that the strategy formulation process involved the views of all the stakeholders as the functional heads and there was a link between middle management and senior management. This indicated that the strategy formulation process is both a top down and bottom up process implying that the firms try as much as possible to consider their internal competencies and capabilities as inputs in the strategy formulation process.

From the analysis of the of the twenty two items used to determine manufacturing strategies, it was determined that the top seven manufacturing strategies used by the firms were; manufacturing with consistent quality and low defects, giving focus on increasing delivery reliability, improve product performance and reliability, reducing overhead costs, implementation of quality circles, reduction in manufacturing lead time and improving delivery speed. Further analysis involving evaluation of the competitive priorities suggested the presence of trade-offs and yielded quality and delivery focus as the dominant manufacturing competitive priorities. Even though analysis of competitive priorities showed a strong focus on quality and delivery control, it suggested the presence of trade-offs among the dimensions. However it is noted that attempting to compete on multiple dimensions is a positive as the firms attempt to outperform their competitors this way. Descriptive statistics on design of process and infrastructure showed that the firms placed infrastructural decisions such as sustainable competitive advantage and quality assurance ahead of structural decisions such as capacity.

The descriptive statistics and factor analysis on the factors that have led the firms to adopt manufacturing strategies showed that the respondent firms identified four major factors or components as the leading reasons in the adoption of manufacturing strategies. These included competitiveness, customer focus, internal capabilities and manufacturing excellence. Results from the regression analysis showed that manufacturing strategy was related to operational performance. F- Statistics confirmed that there was a statistically significant relationship between all the twenty three measures of operational performance and measures of manufacturing strategy.

5.3 Conclusion

This study sought to establish the relationship between manufacturing strategy and operational performance improvement in Kenyan manufacturing firms in the metals and allied sector. The manufacturing firms in the metal and allied sector are key players in the country's economy and have adopted manufacturing strategies in order to improve operational performance.

The findings from the study showed there exists a relationship between manufacturing strategy and operational performance. This implies that organisations that adopt and implement manufacturing strategies are likely to benefit from improved operational performance and hence develop competitiveness. This agrees with and confirms that manufacturing strategy can contribute to a firm's competitive strength (Swamidass & Newell, 1987; Ward & Duray, 2000).

The study established that the manufacturing strategies have been adopted by the firms in the metals and allied sector. The findings showed that quality and cost focus were the dominant strategies and the firms have implemented practices to develop competencies around quality, delivery and product performance. However the study did not clearly show the development of capabilities as indicated in the cumulative capabilities model (Ferdows & De Meyer, 1990). It did however show that the firms considered quality as a base for formulation of effective manufacturing strategy which does agree with the cumulative capabilities model (Ferdows & De Meyer, 1990). The study gave indications to presence of trade-offs even though it was difficult to distinguish between quality and delivery dimensions. However this analogy confirms the trade-off studies concept which proposes that firms must prioritize resources and compete on certain dimensions (Skinner, 1969; Hayes & Wheelwright, 1984). Quality and delivery priorities can be considered to be complementary rather than exclusive. Boyer & Lewis (2002) found that plants increasingly considered all four manufacturing capabilities vital for competitive success and were considered complementary, rather than mutually exclusive, as an existing capability e.g. quality may aid development of other capabilities e.g. flexibility.

The study established that adoption of manufacturing strategies was driven by the four major factors; competitiveness, customer focus, internal capabilities and manufacturing excellence. This agrees with Amoako-Gyampah (2003) that in an emerging economy concerns about the competitive hostility is the factor with the strongest influence on manufacturing strategy choice.

The study found that manufacturing strategy was related to operational performance and that it gave the firms competitive advantage as they could use their capabilities and resources to beat their rivals. This concurs with Schroeder, Bates and Junttila (2002) that competitive advantage as measured by superior plant performance resultes from proprietary processes and equipment. The findings agree with those of Meroka and Nyamwange (2003) in that for firms to be competitive they need to put in place manfacturing strategies.

This study has provided insights into the extent of manufacturing strategy practices in Kenyan manufacturing firms, and provides further evidence that implementation of manufacturing is significant in enhancing operational performance improvement.

5.4 Recommendations

To the industry, this study recommends the adoption and implementation of manufacturing strategy as it will enable the firms acquire capabilities, skills and knowledge for future innovation. Knowledge gained can be used in formulating strategies which would enable the firms have superior operational performance through having the ability to produce goods at low process, have superior quality, be reliable and dependable and ultimately have a competitive advantage.

This study suggests that the firms could adopt the various models of creating effective manufacturing strategies such as the cumulative capability model, concept of focus or trade-offs as a way of institutionalizing manufacturing strategy. These models have proven successful in the developed countries in establishing a consistent set of policies for the various elements of its operations, which support not only each other but also marketing requirements. In the long run the firms shall be able to drive down costs through achievement of efficiencies and effectiveness in the manufacturing processes which will translate in having products manufactured that are of the right quality and reach the customers on time and in the required quantities and in essence eventually enable the firms achieve market leadership and be profitable.

Though the manufacturing firms in the metal and allied sector in Kenya have so far been successful with manufacturing strategy adoption in enhancing operational performance, there is need to focus and maximize more on the indicators that contribute more on achieving operational performance. Organizations such as KAM can sensitize members on the benefits of implementing manufacturing strategies.

5.5 Limitations of the study

The findings of this study should be viewed in light of a few limitations. The use of questionnaire as the data collection tool to gather relevant information on the relationship between manufacturing strategy and operational performance within the metal and allied sector should be noted. The use of additional data collection methods such as interview guides in order to enhance the richness and depth of future studies should be considered.

In addition, access to internal organization documents like strategic business documents, policies, procedures and performance reports which could provide more insight into the strategic thinking of the management specifically on manufacturing strategy and operational performance would greatly have contributed towards a more in-depth review and analysis. Also there was a challenge in the availability of most of the respondents for filling the questionnaires.

Finally, another major limitation was the unwillingness of the respondents to objectively articulate the topic under investigation because of fear of divulging important company secrets to strangers with most saying that they could not fill in the questionnaire without their company's official approval. Some of them complained that the questionnaire was prodding on key issues about their firms and were thus rather careful and restrained in their responses.

This presents a clear need for academic institutions, especially universities to enhance linkages with organizations in the outside world so that they develop a symbiotic relationship. Academic institutions can develop greatly from researching on real issues affecting organisations in other sectors, while the organizations would benefit from researches undertaken by the academic institutions to improve on their operations and subsequently their bottom-line.

5.6 Suggestions for Further Research

This study focused on the relationship between manufacturing strategy and operational performance in the metals and allied sector in Kenya. However, manufacturing or operational strategy is applicable to other sectors of a country including the service sector, universities, non-governmental organizations as well as the entire manufacturing sector.

The researcher proposes that a study be conducted to determine how the applications of operational strategies affect the operational performance in the service and manufacturing sectors in Kenya so that it can be established whether there are benefits of implementing operational strategies in these organizations.

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APPENDICES

Appendix I: Research Questionnaire

This interview guide is designed to collect information on firms which are listed under the metals & allied sector to help answer the research questions and objectives. All information gathered in this research will be treated with utmost objectivity and confidentiality to the subject matter and will not be used for any other purpose other than academic.

Your contribution will be of great assistance to the compilation of this research.

Thank you,

Date…………………………………

Section A: Firm Demographics (Background)

1. **Name of your Organization**……………………………………………………………………..
2. **Name of respondent** (optional)…………………………………………………………..……….
3. **Your title or Position**……………………………………………………………………………….
4. **What department do you work** ………………………………………………………………….
5. **How many years has it been since plant start-up**(Please tick one)

Less than 5 Years	Between 5 and 10 Years	Between 11 and 20 Years	Over 20 Years

6. **No. of Employees** (Please tick one)

Between 5 – 100 Employees	Between 101 – 500 Employees	Between 501 – 1000 Employees	More than 1000 Employees

Section B: Manufacturing Strategies used

1. **How would you describe strategy making process in your organization in relation to formality?**(Please tick one)

Formal	Partially formal	Informal

2. **Who among these participates in the strategy making process and to what extent?** (Please tick the most appropriate)

	Not involved at all	Involved to a small extend	Medium involved	Involved to a high extend	Highly involved
Scale	1	2	3	4	5
Board of directors					
The C.E.O.					
Middle Managers					
Line Managers					
Consultants					

3. **Competitive Priorities (Determining Manufacturing strategies in use)**

Indicate the degree of emphasis which the company has placed on the following activities over the last five years to remain competitive. (Please tick appropriately)

	No Emphasis	Small Emphasis	Medium Emphasis	Higher Emphasis	Extreme Emphasis
Scale	1	2	3	4	5
Cost Priority					
Manufacturing strategy adopted is based on need for reduction of unit costs					
Manufacturing strategy adopted is based on need for reduction of material costs					
Manufacturing strategy adopted is based on need for reduction of overhead costs					
Manufacturing strategy adopted is based on need for reduction of inventory levels					
Quality Priority					
Manufacturing strategy adopted is based on need to develop ability to offer consistent quality with low defects					
Manufacturing strategy adopted is based on need to improve product performance and reliability					
Manufacturing strategy adopted is based on need for improvement of vendor's quality					
Manufacturing strategy adopted is based on need for creation and implementation quality control circles					
Manufacturing strategy adopted is based on need for obtaining ISO 9000 certification					
Manufacturing strategy adopted is based on need to create ability to provide durable products					
Flexibility Priority					
Manufacturing strategy adopted is based on need for reduction of manufacturing lead-time					

Manufacturing strategy adopted is based on need for reduction of procurement lead-time					
Manufacturing strategy adopted is based on need for reduction of new product development cycle					
Manufacturing strategy adopted is based on need for reducing setup/changeover time					
Manufacturing strategy adopted is based on need for developing the ability to customize products to customer needs					
Manufacturing strategy adopted is based on need for developing the ability to offer a broad product line					
Manufacturing strategy adopted is based on need for developing the ability to make rapid product mix changes					
Manufacturing strategy adopted is based on need for developing the ability to make rapid volume changes					
Delivery Priority					
Manufacturing strategy adoption is based on need for increasing delivery reliability					
Manufacturing strategy adoption is based on need for increasing delivery speed					
Manufacturing strategy adoption is based on need for improving pre-sales service and technical support					
Manufacturing strategy adoption is based on need for improving after sales service					

4. What do you think is considered critical in decisions that relate to the design of process and the infrastructure to support manufacturing?

Factors critical in design of process and infrastructure decisions	Not Important	Less Important	Medium	More important	Highly Important
Scale	1	2	3	4	5
Facilities (Size, Location)					
Capacity					
Process Technology (selection of appropriate technology)					
Supply Network					
Planning & Control systems					
Quality assurance and control approaches					
Work Organization					
Sustainable competitive advantage and continuous improvement					

Section C: Factors leading to adoption of manufacturing strategies

Which factors do you think have greatly influenced the choice of manufacturing strategy? (Please tick appropriately)

Factors influencing choice of manufacturing strategy	**Not influential**	**Less influential**	**Medium**	**More influential**	**Highly influential**
Scale	1	2	3	4	5
Need to became the best in class (World Class)					
Continuous Improvement					
Manufacturing capabilities					
Financial reasons					
Need to focus on customers					
Product dimension					
Increased competition					
Resource orientation (tangible & intangible)					

Innovation Orientation (New products)					
Environmental dynamism (factors beyond control of the firm)					

Section D: Relationship between manufacturing strategy and operational performance

1. How have the following Operational performance measures been impacted by manufacturing strategy? (Please tick appropriately)

Operational Performance Measures	**Manufacturing Strategy**	**Heavily Declined**	**Slightly Declined**	**Stayed the same**	**Slightly Improved**	**Highly Improved**
Scale		1	2	3	4	5
Time needed to develop new products or services	Flexibility					
Range of products or services						
Machine change-over time						
Average capacity or Maximum capacity						
Time to change schedules						
Utilization of resources	cost					
Labour Productivity						
Added Value						
Efficiency						
Cost per hour						

Number of defects per unit	Quality					
Level or number of customer complaints						
Customer satisfaction score (index)						
Warranty claims						
Prime first time quality yield						
Scrap & Rework						
Mean time before repair						
Order lead time	Delivery					
% of products on time and in full						
Actual versus theoretical throughput time						
Manufacturing cycle time						
Percentage of orders delivered late						
Schedule adherence						

THANK YOU FOR YOUR PARTICIPATION IN THIS STUDY

Appendix II: Operationalization of Research Variables

a) Independent Variables (measures of manufacturing strategy)

Number	Variable	Variable Type	Scale	Instrument Used
1	Reduce unit costs	Predictor	Nominal	Questionnaire
2	Reduce material costs	Predictor	Nominal	Questionnaire
3	Reduce overhead costs	Predictor	Nominal	Questionnaire
4	Reduce inventory level	Predictor	Nominal	Questionnaire
5	Ability to offer consistent quality with low defects	Predictor	Nominal	Questionnaire
6	Improve product performance and reliability	Predictor	Nominal	Questionnaire
7	Improve vendor's quality	Predictor	Nominal	Questionnaire
8	Implement quality control circles	Predictor	Nominal	Questionnaire
9	Obtaining ISO 9000 certification	Predictor	Nominal	Questionnaire
10	Ability to provide durable products	Predictor	Nominal	Questionnaire
11	Reduce manufacturing lead-time	Predictor	Nominal	Questionnaire
12	Reduce procurement lead-time	Predictor	Nominal	Questionnaire
13	Reduce new product development cycle	Predictor	Nominal	Questionnaire

14	Reducing setup/changeover time	Predictor	Nominal	Questionnaire
15	Ability to customize products to customer needs	Predictor	Nominal	Questionnaire
16	Ability to offer a broad product line	Predictor	Nominal	Questionnaire
17	Ability to make rapid product mix changes	Predictor	Nominal	Questionnaire
18	Ability to make rapid volume changes	Predictor	Nominal	Questionnaire
19	Increase delivery reliability	Predictor	Nominal	Questionnaire
20	Increase delivery speed	Predictor	Nominal	Questionnaire
21	Improve pre-sales service and technical support	Predictor	Nominal	Questionnaire
22	Improve after sales service	Predictor	Nominal	Questionnaire

b) Dependent Variables (measures of operational performance)

Number	Variable	Variable Type	Measures (Predictors)	Scale	Instrument Used
1	Time needed to develop new products or services	Response	Manufacturing lead time, Procurement lead time, Reduction in new product development cycles, Ability to customize products, Broad product line, Rapid product mix changes, Rapid volume changes	Nominal	Questionnaire
2	Range of products or services	Response		Nominal	Questionnaire
3	Machine change-over time	Response		Nominal	Questionnaire
4	Average capacity or Maximum capacity	Response		Nominal	Questionnaire
5	Time to change schedules	Response		Nominal	Questionnaire
6	Utilization of resources	Response	Unit cost, Material cost, Overhead cost, Inventory level	Nominal	Questionnaire
7	Labour Productivity	Response		Nominal	Questionnaire
8	Added Value	Response		Nominal	Questionnaire
9	Efficiency	Response		Nominal	Questionnaire
10	Cost per hour	Response		Nominal	Questionnaire
11	Number of defects per unit	Response	Low defects, Product performance and reliability, vendor's quality, Quality circles, ISO 9000 certification,	Nominal	Questionnaire
12	Level or number of customer complaints	Response		Nominal	Questionnaire
13	Customer satisfaction score (index)	Response		Nominal	Questionnaire

14	Warranty claims	Response	Durable products	Nominal	Questionnaire
15	Prime first time quality yield	Response		Nominal	Questionnaire
16	Scrap & Rework	Response		Nominal	Questionnaire
17	Mean time before repair	Response		Nominal	Questionnaire
18	Order lead time	Response	Delivery reliability, Delivery speed, pre-sales service and technical support, After sales service	Nominal	Questionnaire
19	% of products on time and in full	Response		Nominal	Questionnaire
20	Actual versus theoretical throughput time	Response		Nominal	Questionnaire
21	Manufacturing cycle time	Response		Nominal	Questionnaire
22	Percentage of orders delivered late	Response		Nominal	Questionnaire
23	Schedule adherence	Response		Nominal	Questionnaire

Appendix III: Firms in the Metal & Allied Sector

Serial Number	Company Name	Location
1	African Marine & General Engineering Co. Ltd	Mombasa
2	Alloy Steel Casting Ltd	Nairobi
3	Apex Steel Limited	Nairobi
4	ASL Limited – Steel Division	Nairobi
5	ASP Company Ltd	Nairobi
6	Athi River Steel Plant	Nairobi
7	Atlantic Ltd	Kisumu
8	Blue Nile Wire Products Limited	Kikuyu
9	Booth Extrusions Limited	Thika
10	Brollo Kenya Limited	Mombasa
11	City Engineering Works (K) Limited	Nairobi
12	Cook 'N Lite Ltd	Mombasa
13	Corrugated Sheets Ltd	Mombasa
14	Crystal Industries Ltd	Kikuyu
15	Davis & Shirtliff Ltd	Nairobi
16	Devki Steel Mills Ltd	Nairobi
17	Doshi Enterprises Ltd	Nairobi
18	East Africa Spectre Limited	Nairobi
19	East African Foundry Works (K) Ltd	Nairobi
20	Easy Clean Africa Limited	Nairobi
21	Eldoret Farm Machinery	Eldoret
22	Elite Tools	Nairobi
23	Farm Engineering Industries Limited	Nairobi
24	Friendship Container Manufacturers Ltd	Nairobi

25	Ganglong International Company Limited	Nakuru
26	General Aluminum Fabricators Ltd	Nairobi
27	Greif East Africa Ltd	Mombasa
28	Heavy Engineering Ltd	Nairobi
29	Hobra Manufacturing Ltd	Nairobi
30	Insteel Limited	Nairobi
31	Iron Art Limited	Nairobi
32	Kaluworks Ltd	Nairobi
33	Kens Metal Industries	Nairobi
34	Kenya General Industries Ltd	Mombasa
35	Kenya united Steel Company (2006) Ltd	Mombasa
36	Khetshi Dharamshi & Co. Ltd	Nairobi
37	Kitchen King Ltd	Mombasa
38	Laminate Tube Industries Limited	Eldoret
39	Mabati Rolling Mills Limited	AthiRiver
40	Marvel Lifestyle Ltd	Nairobi
41	Mecol Limited	Nairobi
42	Metal Crowns Ltd	Nairobi
43	Modulec Engineering Systems Ltd	Nairobi
44	Nail & Steel Products Ltd	Nairobi
45	Nampak Kenya Ltd	Thika
46	Napro Industries Limited	Nairobi
47	Narcol Aluminium Rolling Mills Ltd	Mombasa
48	Ndume Ltd	Gilgil
49	Northstar Packaging Ltd	Nairobi
50	Orbit Engineering Ltd	Nairobi
51	Rolmil Kenya Ltd	Nairobi

52	Safal Mitek Ltd	AthiRiver
53	Sheffield Steel Systems Ltd	Nairobi
54	Siya Industries (K) Ltd	Nairobi
55	Soni Technical Services Ltd	Kisumu
56	Southern Engineering Co. Ltd	Mombasa
57	Specialized Engineering Co. (EA) Ltd	Nairobi
58	Standard Rolling Mills Ltd	Mombasa
59	Steel Structures Ltd	Nairobi
60	Steelmakers Ltd	Nairobi
61	Steelwool (Africa) Ltd	Nairobi
62	Tarmal Wire Products Ltd	Mombasa
63	Technoconstruct Kenya Ltd	Nairobi
64	Technosteel Industries Limited	Nairobi
65	Tononoka Rolling Mills Ltd	Nairobi
66	Tononoka Steel Ltd	Nairobi
67	Vicensa Investments Ltd	Kisumu
68	Viking Industries Ltd	Nairobi
69	Warren Enterprises Ltd	Nairobi
70	Welding Alloys Limited	Nairobi
71	Wire Products Ltd	Nairobi

Source: Kenya Association of Manufacturers & Exporters Directory, 2013

Appendix IV: Statistical Results – Factor Analysis

Factors leading to adoption of Manufacturing Strategies

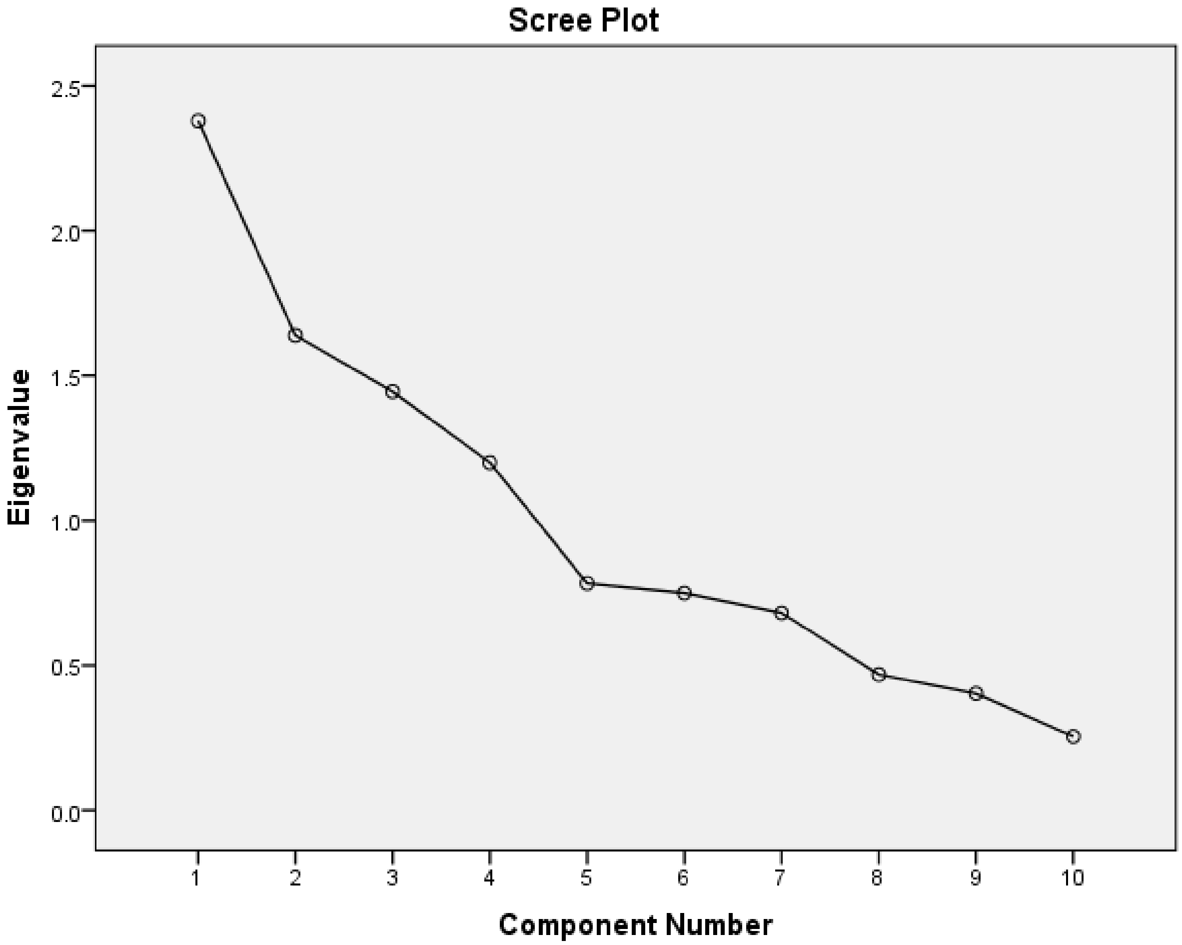
Rotated Component Matrix[a]

	Component			
	1	2	3	4
Environmental Dynamism (factors beyond control)	.714	.091	-.005	-.101
Resource Orientation (tangible & intangible)	.624	-.177	.171	-.167
Increased Competition	.558	.239	-.452	.395
Product Dimension	.149	-.868	-.042	.078
Need to Focus on Customers	.348	.700	-.113	.220
Financial Reasons	.045	.285	.847	.058
Manufacturing Capabilities	.095	-.324	.776	-.100
Innovation Orientation (New Products)	.164	.348	.042	-.734
Need to be the best in class (World Class)	-.112	.297	-.057	.617
Continuous Improvement	.602	.147	.076	.615

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 7 iterations.


Scree Plot
Eigenvalue
2.5
2.0
1.5
1.0
0.5
0.0
1
2
3
4
5
6
7
8
9
10
Component Number