ADVANCED MANUFACTURING TECHNOLOGY AS A STRATEGY IN ENHANCING PERFORMANCE OF LARGE MANUFACTURING COMPANIES IN KENYA

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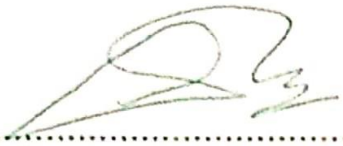
DECLARATION

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



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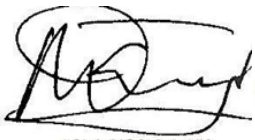

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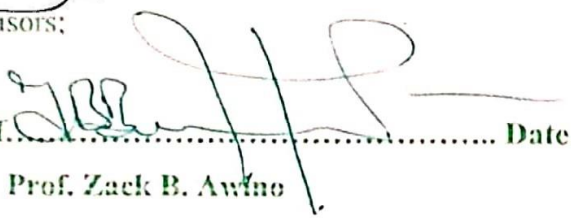

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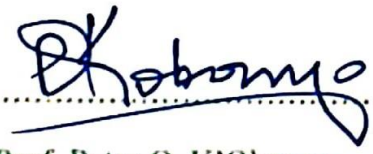

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DEDICATION

To all people of goodwill, and who work towards making the world a paradise for all her inhabitants as they all embrace love for one another.

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Great work of knowledge relies on what already has been done in unveiling what is yet to be known. This thesis is the outcome of the never-ending search for knowledge through consulting different people, literature, institutions, people and learning experiences from strategy and management experts. This experience was awesome to me as the researcher and appreciate the role of other researchers, practitioners, and friends for encouraging me along the way. A few of the people who made this a reality need to be mentioned by name.

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God bless you all.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ABBREVIATIONS AND ACRONYMS

AMT:	Advanced Manufacturing Technology
AfDB:	African Development Bank
BPM:	Business Process Management
CA:	Competitive Advantage
DCA:	Dynamic Capabilities approach
DIT:	Disruptive Innovation Theory of strategy
FDI:	Foreign Direct Investment
GDP:	Gross Domestic Produce
GMP:	Good Manufacturing Practice
GoK:	Government of Kenya
ILO:	International Labour Organization
IMF:	International Monetary Fund
KAM:	Kenya Association of Manufacturers
KER:	Kenya Economic Report
KSh.:	Kenya Shillings
KIPPRA:	Kenya Institute for Public Policy Research and Analysis
KNBS:	Kenya National Bureau of Statistics
KSC:	Kenyan State Corporations
LMC:	Large Manufacturing Companies
MPM:	Manufacturing Process Management

MT:	Manufacturing Technology
NSE:	Nairobi Securities Exchange
OC:	Organizational Competencies
OR:	Organizational Resources
PESTEL:	Political, Economic, Social, Technological, Environmental and Legal External Analysis
PPM:	Production Process Management
RBV:	Resource Based View of Strategy
ROI:	Return on Investment
ROK:	Republic of Kenya
SMEs:	Small and Medium Enterprises
SWOT	Strength, Weakness, Opportunity, Threat Internal Analysis
VRIO:	Valuable, Rare, non- Imitable and Organizational
WCM:	World Class Manufacturing
WTO:	World Trade Organization

ABSTRACT

The purpose of this research was to contribute to the extant knowledge on the relationship between AMT, competitive advantage, organizational resources, and performance of large manufacturing companies in Kenya. The study investigated the mediating and moderating roles of competitive advantage and organizational resources on the relationship between AMT and performance of large manufacturing companies in Kenya. A review of conceptual and empirical literature was done and four hypotheses were formulated to aid the research. The positivist research philosophy and descriptive cross-sectional research design was employed. The population of the study was a census of 55 manufacturing companies that apply design technologies, manufacturing technologies and planning technologies in their operation and were members of Kenya Association of Manufacturers as at December 2020. Primary data was collected using a structured self-administering Likert questionnaire anchored on a five-point scale while secondary data was collected online from the company's annual reports. Descriptive and inferential statistics were used to analyze collected data, while regression analysis was used to test the study hypotheses. Results revealed that AMT statistically predicts performance of large manufacturing companies in Kenya. Results show that competitive advantage statistically predicts performance but partially mediates the relationship between AMT and performance of large manufacturing companies in Kenya. Results also show that although organizational resources statistically predict performance it is not significant on moderating the relationship between AMT and performance of large manufacturing companies in Kenya. Further, the joint effect of AMT, competitive advantage and organizational resources on performance was found to be statistically significant. The study contributes to theory building by demonstrating that AMT is one of the strategies that can be implemented by manufacturing companies to meet their stakeholder needs and improve performance and since resources do not moderate the relationship between AMT and performance, organizations with different resources would observe similar impact on their performance when they apply AMT in their operations. The value of resource-based theory and contingency theory in strategy were confirmed as resources were found to statistically predict performance. Further, the combined effect of AMT, competitive advantage and organizational resources was found to be significant in predicting performance than either of the variables independently, confirming synergy between the variables and their positive impact on performance of large manufacturing companies in Kenya. This study may have been constrained by using one respondent per organization and combining many industries at different levels of AMT adoption. Future researchers could involve more respondents across management hierarchy in each organization involved in a similar study to further validate their findings by focusing on firms at same level of AMT adoption that apply similar technologies in their manufacturing process. The implications of the study include: AMT, competitive advantage and resources have varying effects on performance; AMT can be used as a manufacturing strategy by organizations to improve their performance; and senior Managers need to carefully appraise investments in AMT which on their own do not lead to improved organizational performance as other variables that were not in the current study also affect the relationship between AMT and performance.

CHAPTER ONE
INTRODUCTION

1.1 Background of the Study

Globally, it has been observed that organizations have to be dynamic in their operations to meet the ever-changing customer preferences and market environments. Organizations use performance to measure the extent to which they satisfy preference of their customers. Performance in the past has been determined using financial indicators, but according to Barney and Hesterly (2012), organizations now have the option of using either financial or non-financial performance indicators to effect desired changes in their operations and also make investment decisions. Measuring performance helps organizations identify strategies and goals they need to implement to achieve desired changes in their operations. Some of these strategies include applying advanced manufacturing technology and using resources owned by organizations in their production processes (Monday, Akinola, Ologbenla, & Aladeraji, 2015). Advanced manufacturing technology help organizations to achieve above average performance in their industry, satisfy the needs of their customer, manage operation costs and production flexibility.

According to Barney and Arikan (2008), the resource-based view of strategy offers an explanation on observed difference in performance between organizations in the same or similar industries and environments. The resource-based view of strategy posits that organizations develop competitive advantage and attain superior performance when they recognize strategic resources they own, use these resources to exploit their internal strengths and existing opportunities while minimizing their weaknesses and threats in their external operating environments (Galbreath, 2004; Lippman & Rumelt, 2003; Fahy, 2002; & Barney, 1991). Further, organizations use resources they own to sustain competitive advantage by proactively responding to dynamic factors in the external environment (Teece & Pisano,1994). In contrasting the resource-based view and knowledge-based view of strategy, Theriou, Aggelidis and Theriou (2009) confirm that resources are a vital variable for developing and sustaining competitive advantage, which is built around tangible and intangible resources. Eisenhardt and Martin (2000) on the other hand observed that the resource-based view theory fails to explain with certainty the mechanisms which resources actually contribute to competitive advantage.

Performance of organizations is a key indicator used in management of both public and private organizations. Breznik and Lahovnik (2016), in their empirical study using the resource-based view theory in dynamic environments, found that organizations develop competitive advantage by transforming and aligning resources they own to the existing opportunities in business environments. Gupta, Dangayach, and Rao (2015) through a conceptual study posited that advanced manufacturing technology provides competitive advantage and enables organizations to improve their performance. Morin and Audebrand (2014) confirmed that a positive relationship exists between efficiency and productivity with organizational performance while a conceptual study by Gathungu and Mwangi (2012) in Kenya, concluded that organizational performance is influenced positively by dynamic capabilities. Organizations integrate advanced manufacturing technology across all their business processes to maximize effects of dynamic capabilities on performance in their operating environments (Kearney, 2017; Mclaughlin, 2017).

The contribution to GDP from the manufacturing sector in Kenya has been erratic even as the country anticipates the sector to grow and contribute 15% to GDP by 2025, compared to 9.2% in 2016 and 7.8% in 2018 (KAM, 2019). To achieve the anticipated growth in GDP, the Government of Kenya has developed various strategies and initiatives to propel it to become a newly industrialized country and also be the 5th largest economy in sub-Saharan Africa. Manufacturing companies in Kenya apply advanced manufacturing technology to improve their performance and achieve the projected contribution to GDP. Bigsten (2010) noted that Kenya's manufacturing sector is mostly agro-processing, with the overall structure consisting of SME's and large firms (KNBS, 2019).

According to KER (2017), micro, small and medium firms make up 80% of the companies in the manufacturing sector while large manufacturing companies comprise only 20% but contribute 80% of the sector's GDP (KNBS, 2018). Manufacturing companies adopt advanced manufacturing technology to compete globally, manage production costs, provide desired quality by customers, and introduce flexibility in their production processes (Nyori & Ogola, 2015). The motivation of this study was to investigate the role of competitive advantage and organizational resources on the relationship between advanced manufacturing technology and performance of large manufacturing companies in Kenya.

1.1.1 Advanced Manufacturing Technology

Different studies define advanced manufacturing technology differently, within the general theme of integrated or stand-alone computer systems controlling the manufacturing process (Nyori & Ogola, 2015). Gunawardana (2006) posits that advanced manufacturing technology can be identified by using either the classical continuum or level of integration of technology in the production process. The classical continuum covers the whole manufacturing process using the just in time concept as opposed to the level of integration which is concerned with the level of automation in the whole production process.

According to Youssef (1992), advanced manufacturing technology involves adopting stand alone or integrated technology in the manufacturing process, which improves organizational performance. Integrating technology into the production process, improves information processing time in the production process that leads to quick decision making. Advanced manufacturing technology enables all decision makers in the organization to access real time data on the manufacturing process to make real time changes in the production system and also make long term strategic decisions.

Baldwin, Sabourin and West (1999) on the other hand define advanced manufacturing technology in terms of technologies incorporating the use of both hardware technologies and software technologies towards improving performance. This study adopted the definition of advanced manufacturing technology as, the use of technology to manage and control production processes with the objective of improving organizational performance using design technologies, manufacturing technologies and planning technologies as the dimensions of advanced manufacturing technology.

Due to globalization, manufacturing companies contend with challenges of meeting and exceeding their global customer needs and expectations. Customer expectations include having a fair price for the product, receiving good service/product and feeling valued. Manufacturing companies have relied on mass production since the industrial revolution era to manage production costs and deliver fair priced products to their customers, but they are now adopting advanced manufacturing technology to satisfy needs of their customers by using automated production systems to plan, control the production process, and maintain performance and reliability of finished products. (Jonsson, 2000).

Muogbo (2013) observed that manufacturing organizations have continued to invest in advanced manufacturing technology to mitigate manufacturing challenges associated with global competition, develop and achieve competitive advantage and enhance their performance. Managers can use advanced manufacturing technology as a tool to develop superior products that meet the desired quality, price, and performance by global customers. When organizations invest in advanced manufacturing technology in their production processes, they expect to achieve the following benefits: 1) increased market share; 2) improved production efficiency 3) flexible and focused production and 4) sustained competitive advantage. These benefits emanate from the overall concept of synergy and integrated manufacturing technology (Pearce & Robinson, 2013).

Due to dynamic market conditions, and increased global mobility, advanced manufacturing technologies have continued to gain importance in industries as they address both current and future industry needs in meeting customer preferences (Jabar, Soosay & Santa, 2010). Organizations use customer preferences to understand what drives customer purchasing decisions. Factors that drive customer purchasing decisions include convenience, product/service user interface, stability/reliability of the product, price of the product and available varieties to choose from (Saberi, Yussuf, Zulkifli & Ahmad, 2010). Human labor has been observed to be cheap in developing economies but constitute a significant proportion of production costs in other economies (Gunawardana, 2006). Manufacturing organizations in economies where human labor costs are high, adopt advanced manufacturing technology to replace expensive human labor. This reduces their production costs enabling them to have a more flexible market penetration using pricing strategies.

Due to the high cost associated with implementing technology in manufacturing processes, adoption of advanced manufacturing technology and its successful implementation is generally an expensive undertaking for organizations in terms of resources and time. Organizations develop both financial and non-financial performance metrics to determine the gains and also monitor the benefits of investing in advanced manufacturing technology. This forms part of the justification for investing in advanced manufacturing technology. Generally, the expected and resultant benefits on investing in technology to the organization in the long run, is used to justify the initial high investment costs (McKinsey & Company, 2020).

Advanced manufacturing technology helps organizations develop objectives in line with Porter's (1990) generic competitive strategies, by aligning organizational manufacturing strategies to desired organizational objectives (Tanwar, 2013). Advanced manufacturing technology also enables organizations to attain cost leadership production strategies, which aim at providing services and products to their customers at the least overall cost, but meeting the customer expectations in full as well as differentiation strategies that are aimed at addressing and meeting specific customer needs (Oyedijo, 2013). Taylor (1911), reckons that productivity at the workplace can be increased by simplifying and optimizing jobs, a tenet that leads to mass production and low costs of production. Advanced manufacturing technology aims at reducing production costs through use of small batch production runs.

Although several researchers observe a positive relationship between advanced manufacturing technology and performance, other studies have found no significant relationship between advanced manufacturing technology and organizational performance. Other studies have found that advanced manufacturing technology on its own, is not sufficient to enable organizations achieve lower costs of production, better quality, and higher performance (Gichunge, 2007). Further, Industry 4.0 technologies has brought an advancement in digital technologies, which changes traditional manufacturing architecture and enhances advanced manufacturing capabilities to effectively aid digital transformations of an organization to achieve their sustainable development goals (de Sousa Jabbour, 2018b; Tealukdarie et al., 2018). However, Industry 4.0 technologies pose a challenge because they are relatively new and manufacturing companies face difficulties such as skill gaps, financial constraints and operational complexities when implementing them (Sung, 2018; Raj et al., 2019).

In volatile business environments, manufacturing companies practicing remanufacturing and recycling face problems such as high levels of production losses, excess inventory, and delayed sales order dispatch, which affect the overall operations performance. The role of advanced manufacturing technology on performance has been previously investigated and analyzed using linear regression between the two variables. This study used four variables, advanced manufacturing technology, competitive advantage, organizational resources and performance to investigate the relationship between advanced manufacturing technology and performance in large manufacturing companies in Kenya.

1.1.2 Competitive Advantage

Manufacturing organizations are deemed to have competitive advantage when they can deliver better or the same benefits in a product or service to their customers at reduced costs with higher customer experience compared to competing products by other organizations (Wen-Cheng, Chien-Hung & Yin- Chieng, 2011). Porter (1995) proposed two major types of competitive advantage based on cost leadership and differentiated operations. Cost leadership manufacturing operations are premised on focusing the attention and resources of the organization on reducing the cost at which it is able to offer products or services, optimizing its value chain activities to achieve low-cost-position while maintaining value that meets the customers need (Kimiti, Muathe, & Murigi, 2020).

Further, manufacturing companies are also deemed to be implementing differentiated manufacturing operations when they manufacture a product or provide a service with high quality, achieve fast delivery, are involved in new product designs and product development, and provide products with unique features to the market (Abu-Aliqah, 2012). The level to which manufacturing companies develop and sustain competitive advantage can be ascertained by using financial or non-financial performance indicators. Manufacturing organizations are faced with new and different challenges due to the turbulent global business environment coupled with the advent of the fourth industrial revolution. Turbulence in the manufacturing sector has increased over time due to advances in information technology, improved production technology, changing production methods and increased customer awareness, among other factors (Hakkak & Ghodsi, 2015). Globalization on the other hand has reduced the gap in technology and access to information that existed between developed and developing economies. These changes in the external environment have led organizations to adopt advanced manufacturing technologies in their operations to sustain their market share and also manage competition.

Organizations respond to environment and competitor challenges differently. The response that promises to maintain competitive advantage and counter the challenge posed by competition, should complement implementation of strategies that promise results that are proportional to the threat of competition, to sustain the already developed competitive advantage, reduce product cost and increase product visibility (Karakaya, 2011).

Manufacturing companies have been forced to change their strategies and maintain their competitiveness due to the external environmental challenge posed by Covid-19 to reduce its impact on their operations. Companies that effectively mitigated the effects of the pandemic had supply chain risk management strategies in place, business continuity strategies, diversified supply chains from a geographic perspective, multi-sourced key commodities or strategic components, and considered inventory strategies to buffer against supply chain disruption as methods of sustaining competitive advantage (Deloitte, 2020).

Barney (1991) linked organizational resources to competitive advantage by suggesting that organizations can employ resources that are both scarce and valuable to create competitive advantage. Further, if these resources are inimitable and difficult to substitute in the organizations process, then organizations that own them can sustain the so developed competitive advantage. Organizations tend to acquire knowledge for a period of time to develop unmatched attributes or a combination of superior attributes which includes unique capabilities. The unique attributes then allow the organization to perform better than other organizations and achieve above average returns, in the same industry and environment.

For organizations to survive in their business environments, they should always conduct an internal environment analysis. Organizations that understand their strengths and weaknesses have an opportunity to mitigate against their weaknesses and exploit their strengths to benefit from the opportunities that exist in the external environment (Al-Ansaari, Bederr, & Chen, 2015). Competitive advantage allows manufacturing organizations to become market leaders, by implementing efficient and unique management methods that competitors are not able to imitate easily. It is true that organizations that do not understand their strengths do not knowingly exploit opportunities in their external environment to maintain their performance.

Keegan (2016) used the value chain analysis to explain how organizations can develop competitive advantage by adding specific value to their products or services. Value addition improves key product or service aspects along the value chain that contribute to the success of the related activities. Therefore, every organization should develop its unique and specific way to achieve sustainable competitive advantage, through special and unique processes.

According to Barney (1986) competitive advantage enables organizations to have the necessary information about the market by interpreting the industry environment. Organizations may have competitive advantage that they are not exploiting (Kay, 1993). This is referred to as potential competitive advantage which emanates from the distinctive capabilities owned by an organization that other organizations do not have and are not able to develop quickly. This could be due to lack of knowledge on the existence of this competitive advantage, lack of sufficient finances to deploy the necessary organizational processes to exploit the competitive advantage, lack of organizational competencies to effectively incorporate the competitive advantage in the organizational strategies, and fear of alerting other organizations on the existence of the potential competitive advantage.

Durmaz and İlhan (2015) observed that organizations use potential competitive advantage to grow their market share in order to counter competitive environments in market conditions by realizing that growth is a necessity for businesses. Businesses that do not register growth face the risk of stagnating and finally being overtaken by other competing organizations. Further, lack of business growth is one of the reasons that lead to acquisitions and mergers with the primary aim of increased market share by the acquiring organizations. Therefore, when organizations do not use their potential competitive advantage, they provide an opportunity to others that have identified it to take over their operations.

Although organizations need to be aware of the nature of their external environment as well as their internal capabilities to employ the strategic resources they own, to achieve competitive advantage and above average performance in their industry (Porter, 1985; Barney, 1991), this alone cannot lead to developing or sustaining competitive advantage and improved performance. Progressive organizations always challenge their processes once they know their performance to build a strong focus on their objectives (Zairi, 1994).

Organizations need to take further steps, to maintain and improve their performance. As manufacturing organizations aim to deploy their resources efficiently in order to gain and maintain competitive advantages for survival, they have to contend with competitors, consumers, suppliers, technological developments, and economical impediments to achieve this objective by employing manufacturing strategies and world class manufacturing methods that eliminate these impediments (Dangayach & Sharma, 2011).

1.1.3 Organizational Resources

Organizational resources can be classified broadly into two categories, tangible (financial or physical) or intangible (employee's knowledge, experiences and skills and organization's reputation). Attributes of tangible resources are relatively easy to observe directly while attributes of intangible resources can only be observed indirectly through their effects on operations of the organization and performance (Helfat, 2000). Further, Barney (1991), classifies resources into three broad categories that include physical capital resources, human capital resources and organizational capital resources.

According to Wernerfelt (1984), and using the resource-based view, resources can also be defined as physical assets, intangible assets, and organizational capabilities owned and controlled by the organization. Day (1994) describes organizational capabilities as competencies or expertise employed in organizations operations underlined with accumulated know-how. Organizational capabilities have been identified as the most essential resources organizations employ towards developing and sustaining competitive advantage due to their resistance to duplication. Intangible resources have been observed to be generally diverse by nature and immobile, exhibiting individualistic characteristics, consequently posing a difficulty for other organizations to easily reproduce them fully.

Resources contribute to the organization's market position through the process of improving customer value or lowering the unit production cost or both of them (Gitahi & K'Obonyo, 2018). In so doing, resources allow manufacturing companies to achieve efficient and optimal production processes, as they strive to meet customer needs that include product quality, price, choice and convenience. Although Wernerfelt (1984) reiterates that organizations acquire competitive advantage through both tangible and intangible resources they own or control, not all resources owned or controlled by organization are used or lead to developing and sustaining competitive advantage.

According to Galbreath, (2004) and Fahy, (2002), organizations need to build capacity for exploiting resources they own or control to develop and sustain competitive advantage. Organizations should periodically conduct an audit for the resources they own or control periodically to identify strategic resources they can use to effectively neutralize threats, from both the external and internal operating environments.

Organizational, or structural capital refers to organizational structure, the coordination systems, and informal relationships that the organization maintains with its environment (Wright *et al*. 1994). It represents a special and critical element of intangible resources in an organization that could be both a liability or an asset depending on how the organization exploits its value. Structural capital allows organizations to have and develop a supportive infrastructure that enables it to function in a repeatable and scalable way. This is the resource that always remains in the organization even when there is a high turn-over of the human resource as it is embedded in the organizations processes, data, systems, designs, and knowledge. Some structural capital represented by intellectual property such as patents, trademarks, copyrights and trade secrets, qualifies for special legal protection (Weinzimmer & Esken 2017).

Organizations that identify the structural resources they own and use them in developing their strategies observe an increase in their ability to acquire, utilize and spread organizational knowledge (Wolff et al. 2015; Wang 2008). The increased knowledge base on its part is associated with the organization's innovativeness, proactiveness and risk-taking propensity. Organizations use these attributes in their industry as weapons against their competitors to grow their market and launch new products (Dada & Fogg 2016; Eisenhardt 1989; Noruzy et al. 2013). Dada and Fogg (2016) linked the capability of a manufacturing company to identify emerging business trends that are both industry specific and also due to the general environment, to increased knowledge and use of the resources they own. This ultimately improves risk awareness and their exposure to risk consequently providing the manufacturing company with more confidence in adapting to environmental changes and uncertainty. Therefore, manufacturing companies with a high level of organizational knowledge are more likely to take high-risk-and-high-return adventures (Fernández-Mesa & Alegre, 2015; Kamasak, 2017).

Therefore, structural resources, through organizational learning, influences a manufacturing companies' ability to engage in superior innovative, proactive and risk-taking activities relative to its competitors. Bamiatzi et al. (2016) reckons that when manufacturing companies enhance their ability to innovate, seek existing opportunities and take advanced manufacturing actions, the organizational learning that they consequently develop, can lead to sustained competitive advantage.

The resource-based view of strategy places intangible resources at a higher level compared to tangible resources in terms of creating competitive advantage as they cannot be readily obtained in the factor market. Barney, (1991); Kor and Mesko, (2013); Dierickx and Cool, (1989); and Peteraf and Barney, (2003), proposed that the sources of inimitability observed in the characteristics of intangible resources can be explained by the following mechanisms: historical uniqueness, causal ambiguity and social complexity. It has also been observed that time compression diseconomies and interconnectedness of resources generally aid the organizations to improve their performance (Dierickx & Cool, 1989; Bharadwaj, 2000).

Resource historical uniqueness refers to "unique historical events such as the formation of the organization, building of unique valuable organizational culture, the location of the factory creating distinctive location advantages and choice of market entrance decisions as a first mover, that determine the long-term performance of the firm (Barney, 1991). Unique historical conditions make organizations to exclusively own or control resources making them difficult to imitate by their rivals in the industry.

According to Bharadwaj (2000), causal ambiguity relates to the observed ambiguity on the relationship between the resource portfolio of an organization and its performance. Further, causal ambiguity explains why organizations do not understand the link between resources they own or control and their contribution to sustained competitive advantage, (Barney, 1991). Organizations then continue to sustain the developed competitive advantage as others are not able to imitate their strategies as they do not understand what is the real cause of the observed better performance (Centobelli, Cerchione, Esposito, 2018).

Organizations also develop competitive advantage using socially complex resources that include interpersonal relations among managers, corporate reputation of organizations among customers and suppliers, organizational culture, favorable corporate reputation and sophisticated in-secret technology for the manufacturing firms because they are imperfectly imitable (Chari & David, 2012; Grimpe & Hussinger, 2014; Gupta *et al.*, 2017; Wei *et al.*, 2017; Raithel & Schwaiger, 2015; Stan, 2017). This study investigated the role of organizational resources on the relationship between advanced manufacturing technology and performance of large manufacturing companies in Kenya.

1.1.4 Organizational Performance

Depending on the parameters being used by the researcher, organizational performance has many definitions in academic literature (Gavrea, Ilies & Stegerean, 2011). Various researchers have defined organizational performance using outcomes expected without relating them to the inputs of the process. The simple definition of performance as the relationship between output and input from a production process cannot be used when input variables have not been fully identified. Kaplan and Norton (1992) describe performance as a set of indicators used by organizations to compare actual outcomes to the desired or planned outcomes. Some of the variables that have been used to define performance include strategic orientation (Ahmed, Khuwaja, Brohi, & Othman, 2018).

According to Gautam and Jain (2014) performance of organizations are measurable valuable outcomes or achievements by a team, individual or contributions towards an objective of the organization by an individual irrespective of the method they employ. Ogbeiwi (2017) on the other hand describes performance as the realization of goals that are measurable using financial or non-financial indicators, specific to a particular objective, and meaningful to the organization. There is increased emphasis on using non-financial indicators to measure performance arising from the behavioral school of management. Using performance management systems encourages innovation (Ismail, 2016).

Organizations implement performance management and measurement systems to monitor and maintain organizational control, as a process of keeping the organization on track, in attaining desired goals and objectives through implementation of specified action plans. Further through performance measurement, manufacturing companies are able to; Understand their performance relative to competitors in the same industry, compare performance between product lines/business units and identify product lines that require close attention, develop a culture in the organization that holds employees more responsible for their performance, and understand what makes the company successful. Kaplan and Norton (1992) developed a performance management framework that encompasses a more balanced view between internal and external factors, financial and non-financial measures in the organization, known as the balanced score card to assist organizations determine their performance (Shutibhinyo, 2013).

Currently, the main trend in evaluating company activity shows a shift away from pure financial performance measures (Stobierski, 2020). This shift is explained by many reasons. In particular, inaccuracies in the way of presenting information to different groups of stakeholders, distortions in accounting systems, and growing difference between market value and book value of a company that inevitably leads to changes in corporate evaluation. Financial reports also do not always provide the possibility to compare company results.

The improvements in financial figures can be driven by many factors that do not depend on the company itself. Kotane and Kuzmina-Merlino (2012), posit that, non-financial measures lead to better compliance with long-term corporate strategy by linking them to the strategy and thereby showing what measures drive the financial performance. Also, non-financial measures help with the identification of long-term benefits for investors. Non-financial measures take into account intangible assets, as this provides a view on the actual efficiency and effectiveness of the actual operations.

The level of technology in a manufacturing company has been found to have a positive and significant impact on performance through various research. Wanjiru, Gichira, and Wanjau (2017), found the level of technology in agro-processing companies in Kenya to have a positive influence on performance. Ahmad, Shamsuddin, Wahab, and Seman, (2019) also found that in trying to outperform each other in their industries, manufacturing companies employ technology to develop competitive advantage which allows them to effectively respond to customer issues related to cost, quality, delivery and flexibility. Manufacturing companies understand that they need time to develop technological competency as this is not a short-term process (Hansen, & Lema, 2019).

Empirical and conceptual research reveals that several factors including culture, organizational resources (intellectual capital, human capital, organizational learning), management of enterprise risk, corporate structure, the strategic integration of human resource management, managerial practices related to strategies and corporate governance and supply chain management and technological capability, especially in the fourth industrial revolution impact the performance of manufacturing companies (Harrison & Baird, 2015; Al-Tit, 2017;). Using performance, manufacturing companies can choose appropriate strategies to mitigate these factors (Witman, 2018; Szalavetz, 2018).

According to Yuliansyah and Razimi (2021), non-financial performance measures contribute to eliminating cheating mostly through managerial actions, that are short term oriented and simply serve to increase the financial measures on the account of future revenues as an increase in financial measures based on cheating shows up in the non-financial measures. An example of this could be more orders done, however, with higher amounts of complaints and wrong deliveries.

Performance measurement indicators must be relevant to the performance being measured and aligned to the goals in the process of determining the overall efficiency and effectiveness of the organization's actions. Wholey (1996), relates performance to the perception that exists in people's minds. The perception also relates expected service, components, products, consequences, to the economy, efficiency, effectiveness, cost effectiveness or equity within the operations of an organization.

Jenatabadi (2015) has proposed using the operating organizational environment to analyze organizational performance. This method relates the performance measurement to earlier set objectives and targets, and identifying relevant and recognizable features related to performance. In the post-industrial environment, organizational performance is hinged on the ability to forecast market demands and create production systems that react quickly to meet customer needs. Koetter and Kochanowski (2014) have associated performance to the rate at which strategy responds to the changing operating environment and prudent management of resources within the organization.

Despite the difficulty in defining organizational performance, the central question in its measurement is to determine the parameters, which impact the organization and individual processes (Kaganski, Majak, Karjust & Toompalu, 2017). Organizations are encouraged to use common parameters in the industry when they are comparing their performance against other players in the same industry, but maintain the same parameters compared to a baseline when they seek to know if they are improving especially after introducing new processes. This study defines performance as the extent to which organizations fulfil the needs of stakeholders. The study investigated how advanced manufacturing technology affects organizational performance and the effect of organizational resources and competitive advantage on this relationship.

1.1.5 Large Manufacturing Companies in Kenya

The manufacturing sector in Kenya is made up of large manufacturing companies, medium enterprises, small enterprises and micro enterprises. The KNBS (2016) report categorizes the sector using the number of employees and annual turnover. All enterprises with employees below 100 are either micro, with a maximum of 9 employees, small with a maximum of 49 employees or medium with a maximum of 99 employees. Further, the MSMEs Act 2012 of Kenya has categorized companies using annual turnover, number of employees and total assets. Using the MSME's Act 2012, micro enterprise consists of enterprises whose annual turnover is less than KSh. 500,000, employs less than ten people and whose total assets and financial investment is less than KSh. 10,000,000.

In this study, companies with an annual turnover of over KSh. 100 million, employing 100 permanent (full-time) employees and, having a registered capital of over Ksh. 100 million were considered as large manufacturing companies. This definition has also been previously used by other studies in determining the size of large manufacturing companies in Kenya and in line with the MSME's Act 2012. Globally, the size of micro, small and medium enterprises vary from one region to another, according to the number of employees and the annual turnover. According to the North American Industry Classification (NAICs) code (2019) and Act 5/2015 regarding business financing, a microenterprise is one which has fewer than ten workers and an annual turnover below Ksh. 200 million or total assets below Ksh.200 million. A small business is one which has a maximum of 49 workers and a turnover or total asset below Ksh 800 million while medium-sized businesses are those that have fewer than 250 workers and a turnover below Ksh. 4 billion. Large companies, meanwhile, are those that exceed these parameters.

Most economies rely on the manufacturing sector to create employment, provide opportunities for investment, and manufacture products for consumption. Manufacturing has been found to be one of the routes that developed economies used in their path to becoming industrialized economies (Sheena, 2008). Countries industrialize by transforming and relocating the available labor from the agriculture sector to the manufacturing sector. Studies show that 1 job in the manufacturing sector creates 2.91 jobs in the other sectors of the economy (Bivens, 2019).

The manufacturing companies in Africa have gone through changes that involved national policies that impact businesses, changes in domestic product demand and the ever-changing world market dynamics. Nyabuto (2017) observed that the importance of the manufacturing sector to GDP in African countries has undergone cyclical changes since their independence, but in the recent years all the African Countries are emphasizing the improvement of their manufacturing sector to manage their balance of payments, increase opportunities for employment due to their growing populations, increase production efficiency to effectively utilize the dwindling natural resources, and compete with other countries globally.

According to the Kenya National Bureau of Statistics (2019), there has been slow growth in the manufacturing sector in Kenya. Available statistics by the Kenya National Bureau of Statistics (2019) show that there was an increase (4.2%) of real value add in 2018 compared to the anticipated growth of 0.5% in 2017. An expansion of the manufacturing sector volume of output was realized in 2018 compared to the contraction reported in 2017, while the financial sector recorded an increase in credit demand of KSh 20 billion in 2018 compared to 2017, which was an increase of 6.3%. Formal employment in the manufacturing sector increased by 1.4 per cent in 2018 accounting for 11.1 per cent of the total formal employment while the number of employees in the economic processing zones was observed to have grown by 4.0% in 2018. Further, the contribution to GDP by the manufacturing sector has been erratic with the current contribution at 9% from 7.8% in 2018 and expected to be at 15% in 2025 in line with the Government plans and projections.

Micro, small and medium enterprises in Kenya contribute approximately 20% of the portion of GDP attributed to manufacturing sector while large manufacturing companies contribute 80% (KNBS, 2018). Organizations over the years have used economies of scale and time to gain competitive advantage. This is a major advantage for large manufacturing companies in Kenya compared to many MSME's which are forced to close down after only a short time of operation. Lack of sufficient finances to support the business was the main reason that led to approximately 29.6% of the MSME's closing down (KNBS, 2016). Challenges posed by lack of operating funds for the MSME's, and increased operating expenses, losses due to market competition, and declining revenues from the businesses led to their closure (KNBS, 2016).

Globalization has affected the manufacturing industry through the advancement of information and communications technologies which have simplified hitherto business processes that were deemed to be complicated. Organizations are integrating more globally in terms of sourcing, manufacturing and distribution of their products (Georgise, Klause-Dieter, & Seifert, 2014). The manufacturing function plays a major role in a manufacturing company's competitiveness and performance in its industry. Therefore, manufacturing companies in Kenya need to identify capabilities that assist them to formulate and implement manufacturing strategies to enable their businesses attain desired objectives as they address issues on cost, quality, timeliness, and flexibility, and also focus on increasing market share and profitability.

Manufacturing companies globally have adopted advanced manufacturing technology in their production management processes to meet the following customer needs and also improve their performance; 1) Create Industry strategy by understanding the internal strengths and weaknesses, 2) Identify the appropriate competencies which includes having employees with the correct skills and knowledge, 3) Focus on improving the production processes by having a clear focus on end-to-end process perspective while deciding on the most appropriate technology, 4) Implement new efficient and flexible technologies to reduce waste in the production process (Watson, 2019).

Countries require industrial development to achieve structural transformation (Achuka, 2016). The competitive environment created in Kenya and complemented by the East African regional integration initiatives have imposed different effects on structural transformation and growth of manufacturing companies. The share of manufactured exports by Kenya has reduced in the region due to; improved performance of manufacturing sector in partner states, proliferation of counterfeit products, liberalization of trade, and relocation of manufacturing companies to other regional markets. Swamidass and Waller (1990) suggest that the complexity associated with investigations on justifying the benefits of advanced manufacturing technology require a steady production process which is provided by large manufacturing companies. Following this suggestion by Swamidass and Walter (1990), the researcher used large manufacturing companies in Kenya, which have a steady manufacturing process for the study.

1.2 Research Problem

The effect of globalization, increased customer awareness, and demand for products having superior qualities in the market, are some of the reasons that have led manufacturing companies to develop unique ways of operation, to effectively compete in the resulting turbulent, dynamic, and competitive manufacturing environment. Manufacturing companies, in their effort to find a solution to this emerging global trend have deployed advanced manufacturing technology as a strategy in their production process to improve performance (Swamidass & Kotha, 2000). Advanced manufacturing technology allows manufacturing companies to develop and sustain competitive advantage therefore earning above average returns from their investments (Shishodia & Singh, 2012).

Swamidass and Kotha (2000) found that the inherent information processing capability of advanced manufacturing technologies moderated the relationship between advanced manufacturing technology, and performance. Raghed, Inda, and Noriza (2018) on the other hand found a significant relationship between advanced manufacturing technology and performance of Lean, Agile, Resilient, and Green (LARG) supply chains. Further, Gunawardana (2006) determined that benefits organizations gain by using advanced manufacturing technology to improve performance of organizations, include developing and sustaining product quality. Consistent product quality is one of the product attributes that organizations use to enhance customer loyalty to sustain product demand, earning them a competitive edge over their competitors. Once organizations learn how to sustain their competitive advantage, they maintain and improve their performance.

Sanjeev and Sandeep (2012) found in their study that advanced manufacturing technology enabled manufacturing organizations to attain flexibility, quality, reduce delivery times, and gain global competitiveness. These are some of the product and service selling points to grow the market share of an organization. Percival and Cozzarin (2010) on the other hand found contrary results to this finding observing that some organizations failed to achieve the expected positive results associated with adoption and use of advanced manufacturing technology. Some organizations fail to realize the intended benefits of adopting advanced manufacturing technology in their process due to poor implementation and lack of proper and acceptable methods to assess their effectiveness.

Countries achieve economic prosperity by providing an environment that would nurture a competitive manufacturing industry. Economic prosperity is achieved through full employment and wealth creation. Sheena (2008) observed that industrialization is one of the drivers that countries use to develop and improve their GDP. Countries achieve full industrialization when they fully transform the agricultural products and other raw materials into finished products thus adding total value accompanied with the requisite comparative advantage. Manufacturers in Kenya have an opportunity to increase and improve their performance by enhancing value addition to reduce the export of raw materials especially agriculture-based products (World Bank, 1993).

According to the Big 4 Agenda, the government of Kenya expects the manufacturing sector to contribute 15% to the Nation's GDP by 2025 (GOK, 2018). The contribution to GDP by the manufacturing sector in Kenya averaged 10% for six years, between 2008 and 2014 and has been declining. The sector contributed 8.5% with a growth of only 0.2% in 2017 (AfDB, 2018). Rodrik (2015), classifies this type of performance of the economy as premature de-industrialization. The World Bank (2019) report is positive on the prospects of the Kenyan economy and forecasted that the economy would register an improved growth of 5.8% in 2018 compared to the reported growth of 4.9% in 2017. Further, it is estimated that the Kenyan economic growth increase to 6.0% in 2020 (KEU, 2018).

The unemployment rate in Kenya was observed to be 7.4% in 2015/ (KNBS (2018a). The youth in this category are ordinarily very restless and can be used to destabilize the political environment with adverse consequences to the business and manufacturing environment. The manufacturing sector, when well-developed can create employment opportunities, since the sector is able to generate four times the number of employment opportunities compared to the other sectors of the economy (World Bank, 2015)

Large manufacturing companies contribute over 80% to GDP of the manufacturing sector in Kenya (KNBS, 2018). This justifies the need for Kenya to develop and adopt policies skewed towards improving performance of large manufacturing companies, that constitute approximately 20% of the manufacturing companies and are a vital component of the development strategy for the Country to achieve the desired economic growth by 2030 and also to become the 5th largest economy in Sub-Saharan Africa by 2025.

Boyer (1997) and Dean and Snell (1996), using an empirical study, found a positive relationship between advanced manufacturing technology strategy with performance. Dean and Snell (1996) investigated the internal consistency of an organization. They found that when advanced manufacturing technology is viewed on its own, it may show inhibited results and thus appear to be insignificant in any relationship. Williams and Novak, (1990) confirmed the findings of Dean and Snell (1996) through their empirical study that indeed advanced manufacturing technology complements marketing strategies therefore providing competitive advantage to the organization. These studies did not consider the effect of organizational resources on this relationship with advanced manufacturing technology.

Dangayach and Deshmukh (2015) in an exploratory study on small and medium enterprises found that implementing advanced manufacturing technology helped firms in India develop competitive advantage in quality. Srivastava, Franklin, and Martinette (2013) in their exploratory study on sustainable competitive advantage in companies found similar results to Dangayach and Deshmukh (2015). Advanced manufacturing technology is vital when organizations need to take long term perspectives in building organizational resources and capabilities that provide the highest entry barriers. Ship (2012) in a conceptual study in small and medium enterprises in South Africa found that advanced manufacturing technology helped organizations to become flexible by utilizing their resources to respond quickly and satisfy the ever-changing customer needs.

Despite many studies that have been done on advanced manufacturing technology, researchers have not combined advanced manufacturing technology, competitive advantage, organizational resources, and organizational performance to determine their independent effect and the synergy of the four variables acting together. Large manufacturing companies in Kenya have the requisite financial resources required to comprehensively invest in advanced manufacturing technology, own strategic resources and have a greater role on the Government to achieve the desired development goals. This study therefore sought to bridge this gap by investigating the relationship between the four variables together by answering the following research question: What is the role of competitive advantage and organizational resources on the relationship between advanced manufacturing technology and performance of large manufacturing companies in Kenya?

1.3 Research Objectives

The main objective of the study was to examine the relationships between the variables advanced manufacturing technology, competitive advantage, organizational resources and performance of large manufacturing companies in Kenya.

Specific Objectives

The specific objectives of the study were:

i. To establish the effect of advanced manufacturing technology on performance of large manufacturing companies in Kenya.
ii. To ascertain the role of competitive advantage on the relationship between advanced manufacturing technology and performance of large manufacturing companies in Kenya.
iii. To determine the effect of organizational resources on the relationship between advanced manufacturing technology and performance of large manufacturing companies in Kenya
iv. To establish the joint effect of advanced manufacturing technology, competitive advantage and, organizational resources on performance of large manufacturing companies in Kenya.

1.4 Value of the Study

The study findings are deemed to have the potential to add value to the resource-based theory and the contingency theories by investigating more into joint influences of advanced manufacturing technology, competitive advantage and organizational resources on organizational performance. Use of technology as a manufacturing strategy is indeed preferred to enable manufacturing organizations meet their stakeholder needs. The study demonstrated the value and application of resource-based view and contingency theories in manufacturing organizations.

The study is useful to management practice as managers can use linkages of advanced manufacturing technology and performance to make informed decisions when investing and integrating new technology in the organization's production system to reduce costs and improve product quality. This helps manufacturing companies to develop new products and markets to further enhance their performance and meet customer needs.

Further, the study is useful to management practice as research on linkages of advanced manufacturing technology, competitive advantage, and organizational resources may offer solutions towards performance improvement in manufacturing organizations. The use of design technologies allows developing economies to develop competitive advantage in manufacturing and effectively compete globally with other manufacturing companies from the developed economies. This enhances customer satisfaction and also provides an informed environment for investment as both financial and non-financial indicators are considered to provide the overall performance of organizations.

The study demonstrated linkages between advanced manufacturing technology, competitive advantage, organizational resources and performance of organizations in a developing economy context, Kenya, and more specifically within the large manufacturing organizations that are members of Kenya Association of Manufacturers and also listed in the manufacturing sector on the Nairobi Securities Exchange. Companies listed on the Nairobi Securities Exchange are well-known business organizations which could be used by other companies for benchmarking. The study took place at a time of increased business environment turbulence in Kenya with the Government implementing Vision 2030 and the Big 4 Agenda which are key strategies aimed at transforming Kenya from a developing economy status to a developed economy status.

The findings of this study have also extended knowledge and opened new frontiers in the field of strategic management. That competitive environment partially mediates the relationship between advanced manufacturing technology and performance implies that there are implications on deciding on which of the generic strategies to implement together with advanced manufacturing technology for optimum results. Differentiation strategies were specifically found to have a higher impact on performance when implemented together with advanced manufacturing technology compared to cost leadership strategies.

Further, the findings of this study that organizational resources do not moderate the relationship between advanced manufacturing technology and performance despite organizational resources being significant in this relationship should encourage replication of a similar study in a different context but having larger sample sizes to test the hypothesis further and serve as a reference point and a basis for other future research studies.

1.5 Organization of the Study

This research report is organized into five chapters as described below:

Chapter One: This section of the study introduced the background of the study. The chapter discussed the concepts, context, theory and research problem that guided the research. The main objective and the specific objectives of the study were also developed in the chapter together with a discussion on the values the study.

Chapter Two: This section provides the critical review of previous empirical and conceptual research literature related to the variables of the study, research problem, and theories that guided the study. In particular, the chapter broadly explains the theoretical perspective of advanced manufacturing technology and performance of large manufacturing companies. The discussions on the theoretical and conceptual perspectives of advanced manufacturing technology and performance are grounded on both the resource-based view theory of the firm and the contingency theory of management. The discussions are linked to advanced manufacturing technology as a manufacturing strategy and organizational performance in line with the study objectives. Finally, the chapter identified gaps in the reviewed literature and justified how the study addressed these gaps including the developing of the conceptual model and hypotheses that guided the study.

Chapter Three: This section presents the methodology adopted for the study. The chapter provides a detailed description of all aspects of the design and procedures of the study. It discusses the research philosophy, research design, study population, data collection and questionnaire design and pre-test. Operationalization of research variables, data validity, reliability and testing of assumptions used in the research are also presented. Finally, the chapter presents a discussion of data analytical techniques used in the study.

Chapter Four: This section presents an output of the results ofthe study. The chapter has three sections. The first part presents the preliminary analysis of the data. The second section presents descriptive statistics of the of the data from the organizations that were surveyed, while the last section presents the findings of the relationships of the hypotheses tested. Finally, the summary of key findings emanating from the study are presented.

Chapter Five: This section provides six sections: The first section presents an interpretation of general and major findings of the study followed by, summary and implication of the findings to management practices and limitations of the study. The chapter closes with directions for future research.

CHAPTER TWO
LITERATURE REVIEW

2.1 Introduction

An overview of the study was mentioned in the previous chapter. Manufacturing has evolved from a previously labor-intensive process to the current technology-based processes with the attendant impact to organizational performance. Technology is being incorporated in the production processes to enable organizations meet customer needs. This chapter discusses the theories that supported the study through a review of literature. The theories include the resource-based view which is the main theoretical foundation of the study and the contingency theory which provided the relationship between advanced manufacturing technology and organizational performance. These theories establish the theoretical foundations from which the conceptual framework and research propositions were derived. The theories also guided the study on the relationship between the study variables.

Knowledge gaps to be addressed in the study were identified and as a result the conceptual model of the study was developed. The knowledge gaps that were identified enabled the study to contribute towards addressing strategy, policy, and management issues that had not been previously discussed. The study hypotheses that were used to determine the relationships of the study variables; advanced manufacturing technology, competitive advantage, organizational resources, and performance are presented.

2.2 Theoretical Foundation

The main theory that guided the study was the resource-based view (RBV). The study was anchored on this theory due to the understanding that resources are essential and vital variables for successful organizational performance (Collins, 2020). Ulrich and Barney (1984) relate resources positively to performance, while Wernerfelt (1984) notes that the resource-based view focuses on how resources help organizations to improve their performance relative to their competitors in the same environment. Gitahi and K'Obonyo (2018), on the other hand observed that resources on their own do not lead to improved organizational performance as other variables also impact performance.

The resource-based view theory has been used successfully to identify different types of competencies (Collis & Montgomery, 1997). These includes distinctive competencies which emanate from the ability of an organization to accomplish a task better than any of its competitors. There are two main distinctive competencies as espoused by the resource-based view; resources and capabilities. Barney (1991), Prahalad & Hammel (1990) and Porter (1990) identified development of distinctive or core competencies as pre-requisite for organizations to sustain competitive advantage using the resource-based view.

The study also used the contingency theory which addressed issues regarding structural analysis of organizations (Scott, 1992). The contingency theory posits that operating environment affect the way the organization develops and implements its strategy (Betts & Patterson, 2016). According to Islam and Hui Hu (2012), the design and the how of managing organizations are influenced by contingent factors like technology, culture and the external environment. This theory posits that there is no universal organizational structure that can be implemented in all organizations with similar results. On the contrary, other factors including; use of appropriate technology, nature of the operating environment, organizational size and type of management structure, and the available management information system, also have an impact on organizational effectiveness.

2.2.1 Resource Based View

The significance of resources to competitive positioning of an organization in the industry was recognized by Penrose (1959) even before the emergence of the resource-based theory of strategy. Penrose (1959) argued that organizations own different types of resources which they use to achieve their goals, including better performance, using different strategies. Arising from this argument by Penrose (1959), researchers have investigated the relationship between resources, competitive advantage and performance in organizations.

Alalie, Harada, Mdnoor (2018) used the resource-based view to show that technology helps organizations develop and sustain competitive advantage. Rapid progress and changes in technology has been observed as a key challenge in managing organizational behavior. Technology leads to increased knowledge, development and improvement of organizations, cost management and improved performance (Breznik, 2012).

The resource-based view holds that organizations are successful and gain competitive advantage if they develop and implement strategies that recognize and use the resources they control. Akwesi (2019) notes the significance of identifying and prioritizing resources that fit the resource-based view based on their overall effect on performance. When organizations identify the strategic resources they own, they can use them in SWOT analysis to develop effective competitive strategies. Resources also enable organizations to engage and operate at different strategic levels (Madhani, 2010).

Barney (1992) expanded the definition of resources to include everything used by the organization to transform inputs into useful outputs through efficient and effective processes. This broad definition includes both tangible and intangible resources controlled by the organization. Tangible resources include assets, while intangible resources include capabilities, organizational attributes, and knowledge controlled and owned by the organization.

Further, Barney (1992) classifies resources into three categories as either, physical capital resources, human capital resources, or organizational capital resources. Physical capital resources include the organizations land, manufacturing equipment, buildings, inventory, technology and geographic location. Human capital resources on the other hand include the experience, judgement, and intelligence of the individual managers and workers in the organization while, organizational capital resources consist of the organization's structure, planning, controlling and coordinating systems and, the informal relations among groups within the organization and between the organization and others in its environment.

To manage global complexities in meeting customer demands, resource-based view represents a critical success factor in the use of technology and it is critical while making decisions in organizations (AL-Shbiel, & NH Al-Olimat, 2016). The understanding and use of technology leads to proper operational fundamentals in manufacturing organizations to be created especially in organizations that aim to be competitive globally. Government policy makers and managers in organizations are interested in understanding how global and organizational resources impact international competitiveness as it is a key to growth and business sustainability emanating from the effects of globalization (Liu, 2017).

International competitiveness is currently being driven by the fourth industry revolution which is the new technological revolution. In this new dispensation, the resource-based view is still relevant in explaining the observed competitiveness through new technology and business models like the internet of things, artificial intelligence and the sharing economy being used by organizations (Delgado, Ketels, Porter, & Stern, 2012; Schwab, 2015).

The resource-based view gives managers a useful framework to develop and gain sustained competitive advantage in their organizations despite its limitations that have been observed. The limitations are associated to the framework's incapacity to perform an empirical study on measuring performance due to the difficulty in composing a homogenous sample, secondly it focuses more on the internal analysis of the organization without considering theopportunities and threats presented by external factors, and finally it has a limited ability to make forecasts that are strategically significant (Priem & Butler, 2001). However, Teece and Pissano (1994) and Barney, Ketchen and Wright (2011) defend the resource-based view as its usefulness appears greater in generating understanding and providing a structure for developing strategy.

The RBV is one of the most widely accepted strategic theories in the field of strategic management. It has been widely used to explain the difference in performance between organizations operating in the same industry and environment (Bertram, 2016). There has been debate on the effect of internal organizational resources and capabilities (Prahalad & Hamel,1990) compared to environmental factors (Porter, 1979) to sustaining competitive advantage. The external environment, operating environment, and organizational resources are important variables in creating competitive success (Hart, 1995b).

According to McKiernan (1997), despite the criticisms on the suitability of resource-based view to explain the relationship of resources and competitive advantage in organizations, it has contributed immensely on core competences as strategic assets which enable organizations through innovation strategies to develop new products. Hence, the resource-based view should be considered as an enabler to organizations in developing strategic capability. This helps organizations to be proactive to changes in the external environment.

2.2.2 Contingency Theory

The contingency theory has been used to explain the varying performance observed in different organizations or different operating environments. The theory relies on several factors to show how strategies adopted by management in different operating environments impact the performance of their organizations. Tosi and Slocum (1984) identified three broad areas in clarifying the concepts of the contingency theory. These include, effectiveness, environment and congruency of the variables that allow management to understand how they can apply the contingency theory to understand and improve the performance of their organizations. Generally, the contingency theory holds that due to many different exigencies, there is no single best method to manage an organization.

Effectiveness of an organization in the contingency theory includes all the parameters that are used to measure performance of the organization. These include financial and non-financial indicators like profit, market share, morale, growth, flexibility, efficiency, and quality among others. Further, with the current effects of globalization, effectiveness is also regarded as the ability of an organization to adopt new methods of operation in line with the business environment to bolster their growth (Aldrich, McKelvey, & Ulrich, 1984). Technology is one of the operating methods that manufacturing companies adopt to compete globally and maintain their competitive advantage. The time that organizations take to effectively adopt technology in their operating systems is dependent upon the contingent factors in the operating environment (Van de Ven, Hudson, & Schroeder, 1984).

The contingency theory has been used to investigate different aspects of organizational management with two assumptions that are diametrically opposite (Thai, 2012). The first assumption is that there is only one way for managing organizations in an optimal way while the second assumption suggests that there is no way that is effective and efficient on its own in managing organizations. In effect, the contingency theory is premised upon the understanding that all outcomes observed from the interaction of two or more variables, depends on other variables (Boyd, *et. al.*, 2012). Emanating from the conclusion of Boyd *et. al* (2012), contingencies have an impact on the three levels of an organization's strategy. Further, research has confirmed the causal relationships between contingency factors and adoption of management practices in organizations (Doh, park & Kim, 2017).

One of the factors on which the contingency theory is premised on is the operating environment of the organization. The operating environment consists of political, economic, legal, and social elements (Mintzberg, 1989). The four elements in the operating environment have an impact on the competitive positioning of organizations that can be determined using the five forces position analysis which helps organizations to determine the competitive intensity and attractiveness of a market (Majumdar, & Bhattacharya, 2014; Billy & Abdel-Kader, 2014). The operating environment as a contingent factor together with the five forces can influence directly the behavior and performance of an organization.

Organization size is the second contingency factor. This factor determines the level of operations which manufacturing companies can engage in. Large manufacturing companies tend to own more resources and can invest in the most current technology to improve their performance. The size of the organization as a contingent factor also impacts on the capabilities and implementation of strategies (Doh, *et al.* 2017). Related to their size, large manufacturing companies obtain comparative advantage compared to medium and small companies as they can practice mass production targeting large markets or have a diversified production strategy of manufacturing many products targeting small markets.

Globalization has led organizations to adopt technology to meet the varying demands of the consumer. Manufacturers have to keep up with the changing demands of consumers to keep their market share by engaging more skilled workers and incorporating advanced manufacturing technologies and the fourth industrial revolution in their production process. Advanced manufacturing technologies has made the manufacturing industry to be more efficient (Tsai & Liao, 2017).

A study by Woodward (1965) confirmed that indeed different technologies require different strategies to achieve optimal performance. This is in agreement with the contingency theory where the performance of organizations depends also on the kind of technology employed (Jesmin & Hui Hu, 2012). Further, Billy and Abdel-Kader (2014) describe technology as including; production materials, production equipment, tasks for employees, available software and knowledge. According to Huselid (1995) adoption of performance management systems is influenced by technological complexity, task uncertainty, and technological independence using the generic contingency perspective.

Age and power are the other contingency factors. Young manufacturing companies have a lot to learn in the operating environment and are more innovative as they try many alternative products to establish their niche market, while older manufacturing companies have more experience in managing their markets despite the dynamic operating environment (Fernández-Robin, Celemín-Pedroche, Santander-Astorga, & Alonso-Almeida, 2019). Although the contingency theory relates the age of the organization to ease of developing market efficiency, recognizing and employing appropriate manufacturing processes to meet consumer needs, it can also act as a barrier to change.

There is a significant correlation between technology and the organizational structure (Freeman, 1973). Using this approach of the contingency theory Harney (2016) observed that managing the human resource should be synchronized with the nature of the prevailing aspects of the operating environment of the organization. This contradicts the universal human resource theory which recognizes the impact of the following human resource activities that include; recruitment, Selection, Compensation, Employee participation, Internal labor market and Training on the performance of the organization and are considered to be independent of the operating environment (Syed & Jamal, 2012). The contingency theory recognizes the context and discards the one-size-fits all approach in the implementation of human resource practices. This encourages organizations to implement diverse synergy strategies to improve performance.

The contingency theory also uses the systems approach with specific regard to fit. The systems approach posits that organizational design can only be understood by investigating the contingencies, structural alternatives and performance criteria existing in an organization simultaneously. Further, the systems approach according to Van de Ven and Drazin, (1985) found that there was no best way that an organization could implement the selection, interaction and pattern approaches to fit organizational structure. It is therefore possible that multiple and equally effective alternatives may exist to achieve the same objective. Although the contingency theory posits that there is no best way to manage organizations and by extension, there is equally no best strategy that organizations can use to develop and sustain competitive advantage, Perrow (1980) is critical of its deterministic assumptions and the concept of effectiveness.

2.3 Advanced Manufacturing Technology and Organizational Performance

Decisions involving the investment and adoption of manufacturing technologies in production process by organizations are considered to be strategic as they are both long term and expensive to implement. Organizations that operate in dynamic environments often make strategic decisions to maintain their market share and meet the needs of their customers among other reasons. Management in manufacturing organizations have the responsibility to choose the type of technology to adopt as it must fit the manufacturing process based on the technology acceptance model and innovation diffusion (Jones, Lanctot, & Teegen, 2001). Further, the chosen technology should have positive characteristics and outcomes to performance such as cognitive usefulness and ease of use, relative superiority and ease of compatibility (Davis 1986, 1989; Davis, Bagozzi, & Warshaw. 198; Venkatesh, 2000; Tatnall, 2011).

Manufacturing organizations use technology in their operations to develop competitive advantage in their industry. This is critical for organizations that have regional and global markets where competition is high and the awareness of customers on issues like product price, quality and customer satisfaction are also high. Competition in regional and global markets is high due to availability of similar and substitute products. Manufacturing organizations in these markets deploy technology in their operations to maintain product positioning and sustain their developed competitive advantage (García-Sánchez, García-Morales, & Martín-Rojas, 2018).

Large manufacturing companies adopt new technology in their operations faster compared to small or medium companies due to their high technology capabilities and the resources they own (Zahra & George, 2002). The investing decision in technology is determined by the return on investment and the expected improvement on organizational performance. The magnitude of the improvement in performance, determines the effectiveness of the technology in meeting the desired levels of performance. Organizations of all sizes, large, medium and small invest in some kind of technology to improve their performance. Further, investing in technology encourages absorptive capacity in organizations and lead them to achieve stability strategies, expansion strategies, retrenchment strategies or combination strategies, that form part of their long-term objectives. (Ren, 2019).

According to Bayus (1994), a new competitive environment for manufacturing companies has evolved out of the factors associated with globalization, dynamic markets, increasing consumer awareness, complexity and business uncertainty. It causes a shift in the manufacturing strategies employed by organizations from employing efficient production systems alone to embracing technology that offers both efficient transformation of raw materials into finished products coupled with flexibility in addressing particular consumer demands in their markets (Tracey, Vonderembse, & Lim, 1998).

Organizations in the industrial era practiced mass production to achieve economies of scale using productivity improvement systems. Hawkins (2001) identifies productivity improvement systems to include; lean manufacturing, supply chain responsiveness, the internet, Just in Time and waste reduction. During the industrial era, manufacturing companies employed strategies that were geared to achieving high production efficiency at low total unit production costs (Skinner, 1986). This has changed in the post-industrial era where manufacturing companies now use manufacturing strategies that anticipate changes in the market and use flexible production systems (Tracey, Vonderembse, & Lim, 1998). These strategies include advanced manufacturing technology.

Manufacturing companies achieve their objectives when they align their operation strategies to their corporate and business level strategies. This allows management in manufacturing companies to choose appropriate technologies to employ while utilizing the existing employee capabilities to improve organizational performance. Organizations are able to realize the full potential of the chosen technology by matching available skills to the adopted technology, or by managing skill gaps by training employees on the new technology (Ward, Leong & Boyer, 1994).

Hayes and Pissano (1994) observed that manufacturing systems and strategies have been changing from the industrial to post-industrial era. These changes have been brought about by the need to efficiently carry out responsible manufacturing which entails conserving the environment while providing consumers with their preferred products. Competition has also contributed to manufacturing companies investing in advanced manufacturing technology thereby transitioning manufacturing from the earlier preferred economies of scale to economies of scope (Goldhar & Jelinek, 1983; Hayes & Pisano, 1994)

Researchers define advanced manufacturing technology broadly as the application of stand- alone, intermediate or integrated computer systems in the production process with the objective of improving organizational performance. Díaz-Reza, Mendoza-Fong, Blanco-Fernández, Marmolejo-Saucedo, and García-Alcaraz, (2019) found in a survey study involving 383 respondents that stand-alone advanced manufacturing systems were ranked as the best, integrated advanced manufacturing systems were ranked at the second position while intermediate advanced manufacturing systems were third in enabling organizations improve their performance. This finding advocates the use of advanced manufacturing technology in all organizations as the cost of investing in stand-alone advanced manufacturing technology is relatively low and is affordable to all organizations.

All the three classifications of advanced manufacturing technology, stand-alone, intermediate and integrated systems use one or a group of computers to manage the manufacturing processes. Researchers have identified different groups depending on their impact and expected outcome in the manufacturing process. Kotha and Swamidass (1999) identified four groups of advanced manufacturing technology as follows: (1) Product design technologies that included computer aided design (CAD) and computer aided engineering (CAE); (2) Process technologies that include flexible manufacturing systems (FMS), numerically controlled machines (NC), and programmable logic controllers (PLC); (3) Logistics/planning technologies that include all production scheduling systems, shop floor control systems and materials requirements planning systems (MRP I).

Nyori and Ogolla (2015) on the other hand consider advanced manufacturing technology to consist of three groups, design technologies, manufacturing technologies and planning technologies while Cook and Cook (1994) have the following family of technologies; CAD, Computer aided manufacturing (CAM), FMS MRP II, automated material handling systems, robotics, CNC, computer-integrated manufacturing (CIM) systems, and just-in-time (JIT). This study has conceptualized advanced manufacturing technology to include three groups. The first group, design technologies consist of CAD, CAE, Computer aided process planning (CAPP) and Group technology (GT). This group of advanced manufacturing technologies are concerned with the manufacturing processes that involving product definition, and design-related information processing functions.

The second group, manufacturing technologies, consist of CAM, Computer Integrated Manufacturing (CIM), Computer Numerically Controlled machines (CNC), Numerically Controlled machines (NC), FMS, PLC, computer aided inspection (CAI), Industrial robots, Automated Guided Vehicles (AGV), and Automated Storage and Retrieval Systems (AG/ AS). These technologies are used to manage all the manufacturing processes. The third group, planning technologies consist of MRP I, Manufacturing resource planning (MRP II), Computer preventive maintenance planning (CPM), JIT, Management information systems (MIS), Enterprise resource planning (ERP), Total quality management (TQM) and Customer relationship management (CRM). This group of technologies relate to controlling and monitoring the material flow and related logistical information for the production process.

Organizations adopt advanced manufacturing technology as part of their manufacturing business level strategy to implement either cost leadership or differentiation strategies in their operations. Business-level competitive strategy has grown in both sophistication and acceptance in enabling organizations to develop competitive advantage (Prahalad & Hamel, 1990). For organizations to maintain the developed competitive advantage and improve their performance, they employ both advanced manufacturing technology and their core competencies to realize both their short term and long-term objectives. Organizations use flexible manufacturing technologies to adequately respond to the changing environment factors in the market that relate to customer choice.

Advanced manufacturing technology enables organizations that operate in broad markets to shift from mass production to mass customization of products by lowering their unit cost of production and increasing productivity (Nyori & Ogola, 2015). The ability for organizations to successfully practice mass customization in their production process is limited by the extent to which they have the requisite consumer information. Mass customization also depends on the competence exhibited by employees in using advanced manufacturing technology to translate consumer perspectives into the required product quickly, easily, and in a cost effectively manner. Employees are required to continuously increase their knowledge either through training by the organization or on through their own initiatives to remain relevant in the new dispensation of employing mass customization.

The findings from a study by Kotha and Swamidass (2000) in 160 manufacturing organization in the US show that a fit exists between advanced manufacturing technology and organizational performance. Specifically, Kotha and Swamidass (2000) found a significant and positive relationship between advanced manufacturing technology and cost leadership strategies. Organizations implement cost leadership strategies to have the greatest impact on their revenues and profits by offering competitively priced product. Advanced manufacturing technology allows organizations to carry out large scale production to achieve economies of scale with the attendant low production costs. Through applying advanced manufacturing technology organizations realize better profits, increased market share, improved business sustainability, creates more capital for business growth and, reduced competition from the marketplace.

The study by Kotha and Swamidass (2000) also found a significant and positive relationship between advanced manufacturing technology and differentiation strategies in organizations that show superior growth. Through advanced manufacturing technology, organizations are able to provide customers with unique, different and distinct products from their competitors and gain competitive advantage in the market. Manufacturers are also able to carry out successful product innovation, offer their customers product-level differentiation and price differentiation as they build their brand through coupled with user convenience from the offer of a variety of products. When organizations apply advanced manufacturing technology to achieve differentiation, they improve their performance through; reduced price competition, unique products offering, better profit margins, consumer brand loyalty and no perceived substitutes.

Finally, on the generic strategies and advanced manufacturing technology, Kotha and Swamidass (2000) found a significant and positive relationship between advanced manufacturing technology and focus strategies in organizations. Organizations use advanced manufacturing technologies to concentrate on particular markets that they understand well enough their pertinent dynamics and the specific unique consumer needs, to develop unique and low-cost or well-specified products required by these markets. Organizations improve their performance by offering excellent customer service and build strong brand loyalty amongst their customers.

Despite the benefits that organizations expect to gain by applying advanced manufacturing technology in their production process, Hyneck and Janecek (2012) observed that organizations do not automatically achieve higher productivity, better product quality, and lower production costs just by using advanced manufacturing technology. Organizations should own strategic resources besides applying advanced manufacturing technology in their production process to realize the expected benefits (Amit & Schoemaker 1993); Grunert & Hildebrandt, 2004). Organizations need both financial resources to acquire the appropriate technology besides the other strategic resources that would lead to improved performance.

Ghani, Jayabalan, and Sugumar, (2002) in a study carried out in 27 organizations involving 927 employees, found that organizations only reported modest benefits from what they expected after applying advanced manufacturing technology in their operations. Ghani, *et. al* (2002) identified mechanistic structures as one of the reasons for this finding. Sinqobile and Alan (2019) found in a descriptive study that organizational structure contributed to organizational performance as it inhibits or promotes performance depending on the effectiveness between Supervisory relationships and workflow influence. Further, Prahalad and Hamel, (1990) reckon distinct competencies that emanate from organizational structures make organizations to create sustainable competitive advantage. Arising from these findings, organizations need to implement structures that can create synergy with advanced manufacturing technology to fully realize the intended benefits.

Chamarbagwala, Ramaswamy, and Wunnava, (2000) found a discrepancy between technology levels in developed and developing economies due to differences in access to better financial position, employees with higher skills and experience, and employees having a broad knowledge of technologies in developed Countries compared to developing Countries while Putranto, Stewart, Moore, and Diatmoko, (2003) in an empirical study found that manufacturing companies in developing economies do not have the same capability as those in developed economies in terms of available technology. These observations bring to the fore the difference in expectations on performance between developed economies and developing economies when they apply advanced manufacturing technology in their production systems.

Hasan, Nuri, Turan, and Tolga (2013) in an empirical study on advanced manufacturing technology noted that product innovation, offering higher quality products and speed to market are important strategies for survival in dynamic environments. These attributes associated with product development enable manufacturing companies to maintain their leadership position. Through advanced manufacturing technologies and correct implementation of Porter's five forces in their external environment organizations can maintain and improve their performance. According to Sun (2001) the learning curve associated with advanced manufacturing technologies in China, affects the payback time and level of organizational performance. There is a need to determine other variables that could reduce the learning curve for organizations to realize the benefits of advanced manufacturing technologies.

Nyori and Ogola (2015) observed that changes in the manufacturing processes and systems used in design and production processes are a requirement for organizations to meet the emerging customer needs and that advanced manufacturing technologies provide a solution and benefits to manufacturing companies in meeting the complexity and turbulence in the industry environment. Further, Gunawardana (2010) found that advanced manufacturing technologies enhance organizational performance as they allow the use of computer technologies in managing the complete range of production activities in a manufacturing process, thereby increasing production efficiency.

Dangayach and Deshmuk (2015) have presented a seamless link between the technological potential and the global manufacturing challenge to meet the ever-changing customer needs although companies that use advanced manufacturing technology in different configurations, find it difficult to attach and identify resultant benefits to a particular configuration. Kotha and Orne, (1989), using conceptual models positively link manufacturing strategy, business strategy, structure, environment, and performance. The flexibility of advanced manufacturing technology has enabled organizations to; create new opportunities, adjust their production processes quickly and easily to meet customer needs and economies of scale based on low volume and low cost of production to achieve similar results as mass production for a stable growth in dynamic consumer markets (Hewitt-Dundas, 2000).

2.4 Advanced Manufacturing Technology, Competitive Advantage and Organizational Performance

Change is a vital business characteristic. The manufacturing industry has witnessed great transformations in the last 25 years according to Donald, Andrew, Matteo, Andrea, David, Steven, and Michael (2013). This transformation has been caused by the changing and unpredictable consumer demands, competitive markets coupled with increasing manufacturing capabilities globally, and increasing availability of advanced manufacturing technologies (Leong, Snyder & Ward, 1990). Global competition has made the manufacturing industry environment become turbulent making the changes to be inevitable in response to issues such as increased availability of both cheap and expensive labor supply in the developing and developed economies respectively. Foreign direct investments on the other hand are unlocking new sources of competitive advantage (Donald *et al*. 2013).

According to Oxford Economics (2013), globally, manufacturing companies are undergoing a great transformation with uncertain prospects for the global manufacturing landscape. Financial crisis and recession have highlighted structural problems in developed economies inhibiting growth of the manufacturing sector while the emergence of a huge middle class which requires consumer goods and huge infrastructure investment have led to growth of the manufacturing sector in developing economies. External market shifts and technological changes in both developed and developing economies have led to new operating environments that require manufacturing companies to embrace new tactics to develop competitive advantage in a new era of growth, change, and economic opportunity. Oxford Economics (2013) reckon that competitiveness rests on the transformation speed to respond to market shifts and technology trends from their findings in a study of more than 300 global executives.

The rapid changes witnessed in the global markets have resulted in manufacturing companies investing in product innovation to reduce the product life cycle and improve product quality in response to the informed customer demands. This phenomenon is replacing the traditional mass production operations with low-volume, high-variety production systems (Gunawardana, 2010).

Manufacturing organizations are able to address the dynamic operating environment and improve their performance in cost management and process leadership by applying advanced manufacturing technology in their operations (Shahmansouri, Esfahan, & Niki, 2013). Managing costs is one of the main tasks for managers in any organization as it determines the difference between organizations that are thriving and those that are struggling. Low costs proffer competitive advantage and better margins to organizations while developing their pricing policies. Low costs and product prices also grow the consumer base and increase the market share as more consumers are able to purchase the products. Process leadership on the other hand relates to effectiveness and efficiency by the organization in transforming information, materials or business commitments into outputs that are valued by customers.

Results from studies done by various researchers, have confirmed that advanced manufacturing technology has a positive relationship with performance in several ways. Nyori and Ogolla (2015) observed that advanced manufacturing technology leads to reduced employee turnover. Employee turnover is expensive to the organization as the replacement exercise may include training the new employee to attain the required skills and competence to effectively perform the tasks. Employee turnover affects productivity as the exiting employees are already familiar with the objectives of the organization and their individual roles to make the organization achieve the desired performance. High employee turnover also reduces the overall morale and motivation of employees in the organization.

Haruna, Gakure and Orwa (2015) noted that advanced manufacturing technology enabled small and medium scale enterprises in Nigeria to develop and manufacture high quality, high precision products at low cost with short delivery times. One of the parameters that consumers use to maintain their product loyalty is the quality of the product. Loyal customers are instrumental to organizations for growing the brand of the product, increasing sales revenues and growing the market share. Dangayach, and Deshmukh (2005) in their study on small and medium enterprises in India also found that advanced manufacturing technology enabled these companies to entrench quality in their production process.

Mora-Monge, González, Quesada and Rao, (2008) in their study on advanced manufacturing technologies in North America found that there was increased performance associated with implementation of advanced manufacturing technologies which made multi-national companies in North America extend the use of these technologies in their manufacturing companies in other markets in the developing economies. Therefore, advanced manufacturing technology allows transfer of skills and knowledge by multi-national companies from developed economies to developing economies. Since the HR costs are generally higher in developed economies compared to developing economies, multi-national companies are able to use advanced manufacturing technology in their production plants located in developing economies and supply their global markets without impacting on product quality while reducing their overall HR and product costs.

Small and medium enterprises realize benefits in their operations when they apply CAD, CAM, virtual manufacturing technology, and integrated virtual private networks in varying configurations in their manufacturing processes (Haruna, Gakure & Orwa, 2015). All organizations can apply advanced manufacturing technology that suits their operations depending on their manufacturing strategy. Further, the manufacturing strategy determines whether the organization adopts stand-alone, intermediate or integrated advanced manufacturing technologies. Integrated advanced manufacturing technology deploys all or most of the advanced manufacturing technology groups namely; design technologies, manufacturing technologies and planning technologies in their production process.

Swamidass and Newell (1987) describe strategy as a set of actions or patterns of actions executed by organizations to achieve desired goals. According to porter (1987), organizations can implement three types of strategies depending on their product positioning in the market. These strategies include cost leadership strategies, differentiation strategies and focus strategies. Whereas cost leadership strategies and differentiation strategies target broad markets, focus strategies target niche markets where the organization offers more specialized products and more attention to the customers to cultivate customer loyalty. Organizations use advanced manufacturing technology to deliver their strategy in their preferred markets. This is possible due to ease of adaptability and flexibility associated with advanced manufacturing technology.

Kotha and swamidass (2000) found in their empirical study a significant relationship between differentiation strategies and advanced manufacturing technology. Manufacturing companies are able to use advanced manufacturing technology to meet the specific needs of their customers, by differentiating their products at the market place. Whereas organizations that are competing in international markets should focus their differentiation strategy on specific segments, the general aim of the differentiation strategy is to help the organization enhance the experience a customer gets from using its product/service by providing them products that exhibit greater reliability, durability, convenience, or ease of use compared to their competitors (Dopico & Calvo-Poral, 2011; Porter, 1985).

Manufacturing companies operating in open markets can use advanced manufacturing technology as part of their manufacturing strategy to compete effectively against their competitors. Open markets are characterized by high quality substitute products where customers have a wide selection of products that meet their needs while manufacturers easily access resources for manufacturing. Gaining competitive advantage in these markets requires more than strategic resources for companies to achieve above average returns on their investments. Manufacturing companies can use advanced manufacturing technology to achieve and sustain competitive advantage to reduce their product cost, increase their product quality, reduce the production and delivery time and practice continuous innovation (Alnawaiseh, AL- Rawashdi, & Alnawaiseh, 2014).

Swink and Nair (2007) in their empirical study from 224 companies found that companies that employed design technology groups of advanced manufacturing technology gained competitive advantage and achieved better performance compared to their competitors. Further, Swink and Nair (2007) also found that planning technology and manufacturing technology groups of advanced manufacturing technology had a positive impact on new product development and process flexibility. Regarding the relationship between process flexibility and advanced manufacturing technology, Cook and Cook, (1994) also found that advanced manufacturing technology allowed manufacturers to be more flexible as they were able to integrate product design and production processes which enhanced their competitive advantage and performance. Manufacturing flexibility allows organizations effectively react to changing customer needs.

Marri, Gunasekaran, Sohag (2007) in an empirical study carried out in Pakistan concluded that lack of accepting long term objectives hindered effective utilization of advanced manufacturing technology. Long term objectives determine the competitive strategy being pursued by the organization. These objectives are determined by organizations in relation to their growth strategies that address both market and product growth, performance improvement and diversification to mitigate business risk. When organizations fail to recognize long term objectives, in effect they also lack annual plans and budgets and may not be consistent in identifying their performance indicators. In these circumstances, investing in advanced manufacturing technology may not have the desired impact to the organization.

Kotha and swamidass (2000); Dean and Snell (1996); Parthasarthy and Sethi (1992) in empirical studies found no significant relationship between advanced manufacturing technology and cost leadership strategies although there was a significant relationship between advanced manufacturing technology and performance. These findings allude to the long-held position that cost leadership relates strongly with mass production and therefore organizations that implement cost leadership strategies and do not practice mass production may not find value from investing in advanced manufacturing technology, which allows organizations to achieve superior growth strategies with higher performance.

Burcher and Lee (2000) in a study in organizations in UK did not find a significant relationship between planning technology groups and manufacturing technology groups of advanced manufacturing technology and performance. Burcher and lee (2000) advise that more time is required in order to assess the real cause of performance improvement in organizations that have implemented advanced manufacturing technology in their production process. The cost related to the implementation of these two advanced manufacturing technology groups are high especially when complex manufacturing processes are involved. The high investment costs are not consistent with cost efficiency resulting in the findings of Burcher and Lee (2000). Davenport (1998) and O'leary (2000) found that implementing some advanced manufacturing technologies such as ERP are high. Since planning technologies, which includes ERP technologies, is associated to lower cost efficiency, the usage of the technology may appear to be high.

Despite the findings from studies that show that advanced manufacturing technology does not have a positive impact to performance in manufacturing organizations, Saberia and Yusuff (2011) hold the view that advanced manufacturing technologies are important when manufacturing organizations are implementing strategies to help them gain competitive advantage. In a study they conducted in Malaysia, they observed that advanced manufacturing technology helped companies increase product quality, reduce lead-times, and achieve greater flexibility. The pre-requisite required by manufacturing organizations to achieve these benefits includes, possessing appropriate technological skills that are aligned to the manufacturing strategy, culture and the organizational structure.

In a cross-sectional study done by Theodoroua and Florou, (2008) in manufacturing organizations in Greece, financial performance was observed to be greater for organizations which emphasized a higher level of flexibility and the middle level of cost. Further, quality and product innovation were also observed to have a positive relationship with performance. Flexibility in manufacturing systems refer to the ease and ability to effectively manage variations in the production process. Advanced manufacturing technology allows manufacturing companies to achieve both machine flexibility and routing flexibility which are essential towards producing new types of products, and the ability to change the order in which operations are executed or the ability to use two or more machines to perform the same task, and the system's ability to handle large-scale changes like significant increase in volume and/or capability.

Finally, Kotturu and Mahanty (2017) in their study concluded that advanced manufacturing technology enabled organizations to; achieve high product quality standards, offer competitive product prices, meet customer delivery schedules and service level agreements, develop new products to meet market demands, manufacturing flexibility, and reliability. For organizations to sustain competitive advantage and improved performance through applying advanced manufacturing technology in their process, they also need to continue training all their workforce and raising the awareness on the use of technology, carry out capacity expansion that addresses organizational capabilities, invest in research and development and manage the cultural orientations that do not support embracing technology and change.

2.5 Advanced Manufacturing Technology, Organizational Resources and Organizational Performance

Recognizing sources of sustained competitive advantage that impact on organizational performance is a major area of study in strategy. Researchers have been involved in different investigations to determine why organizations in the same competitive environment achieve different performance (Bridoux, 1997). Researchers have used the resource-based view as one of the theories to explain this observed difference in performance. The theory is premised on organizations competing on the basis of the resources and capabilities they own. Resources owned by organizations fall under two main categories, tangible and intangible resources and include anything used by individual employees or a group of employees to help them achieve their goals and subsequently the goals of the organization (Halbesleben, Neveu, Paustian- Underdahl, & Westman, 2014; Collis, 1994). Resources can also be strategic or non-strategic.

Using the resource-based view, Barney (1991) proposes characteristics that a resource should have to confer competitive advantage to an organization. This view has been improved by other researchers who have determined that resources alone may not lead to better performance as other organizational orientations have been found to be significant and positively related to organizational performance (Porter, 1991; Grant, 1996; Newbert, et al., 2008; Herath &Mahmood, 2014; Gitahi & K'Obonyo, 2018; Jeong, Pae, & Zhou, 2006; Paladino, 2009). Further, organizations need a combination of both tangible and intangible resources to attain higher profits (Greco, 2013).

Further, in an empirical study carried out in 102 firms in Vietnam, Tuan and Takahashi (2009) found that organizations are able to transform and enhance the competitive value of resources they own using different types of technology. Organizations are able to incorporate advanced manufacturing technology in their operations and using different resources be able to develop different capabilities with attendant performance levels. Kaplan and Norton (1996) have provided a model that organizations can use to measure their performance which is the level which the organization meets its goals and objectives. Organizations in the past have used financial indicators to measure performance, but this has changed as non-financial indicators have also been found to provide a reliable measure on organizational performance.

Organizations are facing new and dynamic operating environments, informed investors demanding high returns on their investments and ever-growing competitiveness from the operating environment. The non-renewable strategic resources owned by organizations are also diminishing and there is need to use efficient methods when using these resources in the manufacturing process. Unsal and Cetindamar (2015) found in an empirical study on technology management capability that organizations investing in technology are more at ease in containing the emerging competition spurred on by globalization. Rapid growth in technology has given rise to several opportunities that organizations can use to sustain their competitive advantage. Advanced manufacturing technology has the capability of interfacing effectively with the fourth industry era technology, where availability of information and data management determine the performance of organizations.

Further, Unsal and Cetindar (2015) recommend that organizations should excel in efficient manufacturing methods that offer cost effective production processes, possess sufficient flexibility to allow them quickly adapt to the changes in the market and, invest in resource development and renewal. Organizations lose their market share when they fail to anticipate changes in the market, are not able to meet specifications of emerging product trends or fail to meet the new customer needs. Advanced manufacturing technology as an aid to the manufacturing process contributes to the organization's ability to develop competitive advantage by providing organizations with the solution to these issues.

The recommendations of Unsal and Cetinder (2015) for organizations to use advanced manufacturing technology in their production processes to improve performance is consistent with the findings of Wu and Wang (2007) from the empirical study they conducted in Taiwan. Wu and Wang (2007) found that technology contributes towards improving organizational performance by creating and sustaining competitive advantage. Advanced manufacturing technology is a technological asset or strategic resource owned and used by organization to improve the efficiency and effectiveness of their manufacturing processes. Wu and Wang (2007) advocate organizations to mature in the use of advanced manufacturing technology to realize the full positive impact of technology on performance especially when organizations have to quickly adapt to changing environmental conditions and rapid technological progress.

Levinthal and Myatt (1994) argue that performance of manufacturing organizations is determined by how resilient they are to the product market fluctuations and in accordance with the strategic resources they own. The resilience of organizations is an indication of the level they can proactively anticipate adverse market conditions and mitigate the market fluctuations using appropriate manufacturing systems. Markets determine the consumption rate and capacity of goods and services offered by manufacturing organizations. The appetite of the market to consume products on the other hand is determined by the nature of the distribution channel and the marketing strategy used. Advanced manufacturing technology fits in all marketing strategies and is used by organizations to maintain their market share by consistently delivering quality products at the customer preferred price, place and time.

Results of an empirical study by Kashan and Mohannak (2015) on organizational micro processes show that organizational capability development explains the ability of organizations to develop and sustain competitive advantage. Organizational capability emanates from the successful management of organizational resources to meet customer needs. Further, organizational capability and the benefits attributed to strategic resources using the resource-based view of strategy, are developed over time by organizations. Consequently, for organizations to realize the full benefits of investing in advanced manufacturing technology, there is a learning period which organizations use to embed it in its production processes.

From the recommendations of Kashan and Mohannak (2015) in their empirical studies on performance, Yousef (1992) described advanced manufacturing technology as a strategy and resource which when appropriately implemented, controlled and evaluated, improves the performance of an organization. For organizations in developing economies, performance of advanced manufacturing technology follows a path that depends on the adoption and implementation process. The adoption process on the other hand is influenced by the preferred configuration which may be stand alone, intermediate or integrated within the production system and the size of the organization. Both small and large companies use advanced manufacturing technology to gain competitive advantage by reducing their production costs as they improve their performance (Li & Xie, 2012).

Day (1994) defines organizational capabilities to include accumulated latent capabilities or expertise that organizations employ in their operations. More recently, Lee (2010) found that technological competence was a factor towards organizations achieving better performance. Technological competence relates to the level of technical knowledge, skills, experience and abilities of employees in an organization and are used to enhance the competitive advantage and performance of organizations. The results from a study on small and medium sized enterprises by Aggelopoulos, Eriotis, Georgopoulos, and Tsamis (2016) confirm the assertion of Day (1994) and emphasize that that design, which can be carried out effectively using advanced manufacturing technology is a positive factor in the innovation strategy.

Wernerfelt (1984) reckons that intangible resources are not susceptible to imitation easily making them to be important variables for organizations to sustain their performance. Unlike physical resources, intangible resources are developed in the organization over a long period of time leading them to be part of the core competencies in an organization. Volna and Papuna (2013) have advanced the argument that organizations can use their core competencies to build permanent and sustainable competitive advantage in their markets and strengthen their brand reputation. Advanced manufacturing technology enables the positive brand perception and reputation by consumers to be realized in the product offering (Youssef, 1992).

Grant (2002) on the other hand observed that competitors can easily identify and place a value on tangible resources, making them easy to duplicate or access. This observation by Grant (2002) is consistent with Michalisin, Smith, and Kline, (1997); and Carmeli and Tishler, (2004) that tangible assets devoid of other aspects of process enhancement are a liability and provide organizations with a limited contribution to competitive advantage. Availability of financial resources on the other hand in an organization has been linked to breakthrough transactions as organizations may be constrained to innovate when they do not have sufficient financial resources (Lee, 2001). This study investigated the role of advanced manufacturing technology and organizational resources on performance in large manufacturing companies in Kenya as they are deemed to have sufficient financial resources to adopt and implement technological strategies in their operations.

2.6 Advanced Manufacturing Technology, Competitive Advantage, Organizational Resources, and Organizational Performance

The demand by investors in manufacturing organizations for improved performance has forced many of them to invest in advanced manufacturing technologies (Swink & Nair, 2007). The investments vary from adopting stand-alone computer technology systems to the more complex integrated computer technology systems that are compatible with their business. The investment costs also vary with stand-alone computer technologies being cheaper compared to the complex integrated computer technology systems. The desire and aim of organizations when investing in advanced manufacturing technology is to enhance their performance.

Several studies have confirmed that advanced manufacturing technology allows organization to realize a wide range of benefits that include increase in; market share, productivity and production efficiency, improved flexibility, enhanced quality, reduced production costs, enhanced competitive advantage, enhanced organizational performance; and potential source for innovation (Kotha & swamidas, 2000). The benefits associated with flexibility enables organizations to produce a wide variety of products, as increased production efficiency leads to reduction of waste in the production process and low unit production costs, while organizations meet the changing consumer needs using enhanced quality (Kotha & Swamidass, 2000).

Due to the Corvid-19 pandemic, all manufacturing organizations have been adversely affected by the economic downturn experienced globally. Organizations have to implement different strategies using well thought out turn-around business principles to regain their pre- Corvid-19 market share and product positioning, which is not easy (Rumelt, 2009). One of the options for organizations is to develop flexible and optimal turnaround strategies in their business recovery plans for them to even remain in business. Technology plays an important role as cost containment is the main task for Managers to implement in developing products whose price fit in the disposable income of consumers (Penros, 1959). Strategic and manufacturing flexibility which organizations get by using advanced manufacturing technology are important factors that influence selection of turn-around strategies in economic downturns to manage performance.

Indeed, Dean and Snell (1996); Gerwin and Kolodny (1992); and Porter (1983) concur in the findings from their studies on effects of strategies on performance, that there is a significant relationship between flexible strategies with performance. Further, Joiner, Sarah Yang Spencer, and Salmon, (2009), found that both financial and non- financial indicators are used to measure performance in organizations practicing flexible manufacturing strategies and these organizations achieve higher performance.

Advanced manufacturing technology is applied in the manufacturing process to utilize its flexibility which allows the manufacturing process to adapt easily to changes in the type and quantity of the product being manufactured. Organizations are then also able to implement make-to-order strategies that allow customers to customize the products they want. By using the make-to-order strategy, organizations do not require to have large warehouse space for storing raw materials or finished product, reducing their material holding costs and unit production costs as well.

Zummato and O'Connor (1992) link this flexibility of advanced manufacturing technology to increased productivity and organizational performance as routine tasks are performed by advanced manufacturing technology consequently reducing unit production costs while increasing production efficiencies. In a study carried out by McDermott and Stock (1999) in 97 manufacturing organizations, they found the ability of advanced manufacturing technology to provide flexibility and efficiency on the product by end users to be its most distinguishing feature. This feature is important in maintaining customer loyalty.

Further, Mcdermott and Stock (1999) observed that the combination of flexibility and efficiency achieved by manufacturing organizations through advanced manufacturing technology, allow organizations to achieve efficiency with low production volumes and product customization at low costs which contradicts the traditional operations management and manufacturing strategies. Over and above the operational benefits, manufacturing organizations also benefit at the organizational level by improving work flow, enhancing communication, increasing employee retention, conserving strategic resources by using efficient and improved manufacturing processes by using advanced manufacturing technology (Zairi, 1992).

Cagliano and Spina (2000); Zummato and O'Conor (1992); Szwejczewski, Sweeney and Cousens (2016); and Scherrer and Deflorin (2017) found in different empirical studies that, planning technology groups of advanced manufacturing technology reduce operation costs and enable organizations to develop efficient and effective production plans. Organizations also develop and implement manufacturing strategies that use existing products to develop competitive advantage and in turn improve organizational performance. Production plans endear organizations to their customers by providing them with reliable delivery timelines.

Organizations develop and sustain competitive advantage in their production process when they recognize the advantages associated with technology. Szász, Scherrer and Deflorin (2016) recommend the use of advanced manufacturing technology in decision making to enable optimal decisions to be made from the data captured by the technology system that incorporates all aspects of the business. Decision making should be made by competent employees who have the full understanding of the impact their decisions have on strategy execution and subsequent organization performance. When organizations have the ability and a platform they can use to make decisions, forecasting and planning for the future becomes easy, and incidences of reacting to the environment are reduced.

José, Macarena, and Pedro (2016) concur with Szász *et.al* (2016) that responsiveness is one of the key performance indicators that organizations need to address arising from the challenges posed by today's markets. Findings of a study conducted by Jose *et al* (2016) involving 441 Spanish industrial companies show that manufacturing organizations invest in advanced manufacturing technology to improve their competitiveness in their various industries and markets. The study also found that performance of organizations improved when implementation of advanced manufacturing technology includes internal integration being supplemented by external integration.

Internal and external integration relates to the efficiency with which the supply chain management works. Internal integration is present when more than one function in the organization are interdependent and the effect of silos within the organization is eliminated. Advanced manufacturing technology helps organizations to achieve full internal integration which is a pre-requisite for external integration. This hastens proper decision-making eliminating delays that would lead to increasing operation costs.

Hou, Chen and Xua (2017) posit that with the current environmental concerns, advanced manufacturing technology offers a solution for manufacturing organizations to comply with global environmental standards without affecting their performance. Organizations are concerned with meeting new stringent manufacturing regulations that insist they use efficient production processes, especially when they are using natural resources, to reduce their ultimate depletion. Environmental conservation is now a global concern and an agenda at global meetings, especially with the adverse effects of global warming that are now being experienced due to toxic emissions that are responsible for the destruction of the ozone layer. Proper planning and design of production processes can assist organizations meet these requirements, besides the approved good manufacturing practices that have been in use for a long time.

Ocampo, Clark, and Tanudtanud (2015) agree that an optimal manufacturing strategy has a great potential in supporting business strategy when structural decisions are aligned to technology. The intended technology to be used in achieving organizational goals should be easy to implement with regard to its utilization by employees and the organization's ability to finance the acquisition. Technology at times undergo rapid changes with adverse impact on production processes. Advanced manufacturing technology is easy to upgrade especially when it is adopted in an integrated manner where upgrading a section would contribute large positive changes to the whole system inadvertently ensuring that competitive advantage for the manufacturing process is still maintained.

Nair and swink (2007) found in an empirical study on the internal and external means used by manufacturing organizations to engage in process technology development, that internal process technology, has a significant relationship with quality, delivery and process flexibility. When organizations are engaged in process technology development, they look beyond the current strategy as replacing technology is expensive. Therefore, the developed technology should have the ability to be used in manufacturing various products and meet the quality specifications over a period of time albeit with minimum modifications in response to the market demands. Speed to the market forms a major competitive advantage to manufacturing companies. This allows organizations to test their new products in the market and respond to any required changes to meet the taste of their customers.

Itami (1987); Jacobs and Whybark (2000) on the other hand found that product technologies enabled research and development in organizations to impact positively with performance more specifically on reducing the overall cost of the research and development function. This emanates from the flexibility associated with advanced manufacturing technology which enables a multidisciplinary team to undertake research on either new or existing products. The resultant product could still be produced using the same process with a few adjustments to the production equipment attachments, thereby greatly reducing the total cost of research and development. Besides developing new products, technology allows organizations to improve their operating processes through research and ultimately increasing the process efficiency and organizational performance.

Davenport (1993); Schoonhoven (1981) and Wheelwright (1978) ascertained that there was a positive relationship between technology, competitive resources and the utilization of organizational resources to performance especially for certain product functionality and cost conditions. When organizations categorize the resources they own into two main clusters of competitive resources and other resources, they can efficiently determine a process in which to exploit the competitive resources to give them an edge in their industry and improve their performance. This is especially true where process technology and innovation is of primary importance as the design of the product stabilizes during the maturity stage. Organizations use both the design and planning taxonomies of advanced manufacturing technology to align the production process to meet their desired objectives.

Boyer, Leong, Ward, and Krajewski (1997) and Swamidass and Kotha (1998) found no direct relationship between advanced manufacturing technology and performance using various studies. The finding by these researchers may have been caused by other exogenous factors, as there exists enough evidence to the significant and positive between advanced manufacturing technology, organizational resources and performance in organizations. Advanced manufacturing technology, when viewed as a technological resource, may not provide competitive advantage as it is easy to copy and be used by other organizations, but when organizations use their competencies which include employee skills in the use of technology, it forms a positive synergy and optimizes performance. This study investigated the role of competitive advantage and organizational resources on this relationship.

2.7 Knowledge Gaps

Literature shows that organizations can achieve competitive advantage by differentiating itself from its competitors. It follows that if the environment changes such that numerous competitors have attained competencies indistinguishable to those characterizing a particular organization, the firm loses its competitive position and would do well to reconsider its strategy. There is no link between critical organization resource, business processes, organizational competencies and organizational performance from this observation. This study aims at investigating the relationship between advanced manufacturing technology, organizational resources, competitive advantage and organizational performance.

Other prior studies in advanced manufacturing technology and performance have addressed the rate of adoption of advanced manufacturing technology in developed economies, demographic variables, and infrastructural variables. This study aims at investigating the Kenyan industry environment where both competitive advantage and organizational resources have an impact on performance.

The effects of advanced manufacturing technology on many aspects of performance are still not clear (Boyer, 1969). The literature review indicates that there is no difference in performance when you compare the investment patterns of manufacturing organizations in terms of those that adopt advanced manufacturing technology and those employing other manufacturing strategies. Swamidass and Kotha (1998) also failed to observe a direct relationship between advanced manufacturing technology and performance suggesting that other variables either mediate or moderate this relationship. Indeed, Das and Ramayan (2003) attempt to give groups of variables that moderate this relationship.

Das and Ramayan (2003) have identified market and product factors, manufacturing practice factors, and work organization factors as variables that affect the relationship between advanced manufacturing technology and organizational performance. This study investigated the role of competitive advantage and organizational resources on the relationship between advanced manufacturing technology and performance in large manufacturing companies in Kenya. Table 2.1 gives the summary of major knowledge gaps and the contribution of this study to this relationship.

Table 2.1: Summary of Major Knowledge Gaps

Author and Year	Focus of Study	Methodology	Main Findings/Conclusions	Knowledge Gaps	Contribution of this Study
Bag, Gupta, and Kumar, (2020)	Investigate the impact of advanced manufacturing technology on degree of Industry 4.0 application and sustainable development.	Descriptive online survey design involving 124 manufacturing organizations	There is a significant relationship between industry 4.0, advanced manufacturing technology and sustainable development	Although study findings show a significant relationship between Industry 4.0, advanced manufacturing technology and sustainable development, there is need to relate this finding to performance	Current study endeavors to determine the effect of advanced manufacturing technology, competitive advantage and organizational resources on performance of large manufacturing companies
Díaz-Reza, Mendoza-Fong, Blanco-Fernández, Marmolejo-Saucedo, and García-Alcaraz, (2019).	To determine the contribution of AMT configuration and their benefits to the organization.	A survey of 383 respondents using a quantitative and statistical point of view and evaluated using the partial least square technique on the contribution of AMT configuration and benefits.	AMT configurations have an impact on organizational performance with Stand-Alone AMT contributing more to organizational performance, followed by Integrated Systems while Intermediate Systems configuration contributes the least to performance.	Study findings provide a relationship between AMT configuration ranking to performance, but the study does not provide the mechanism and variables through which organizations achieve the stated improved performance.	This study included competitive advantage and organizational resources as other variables that affect the relationship between AMT and organizational performance
Zhu, Anqi Liu and Wang (2019).	Investigate the relationship between organizational learning, regarded as intangible resources, and firm performance	A cross sectional survey of 450 participants who were either founders or professional managers in an executive training program	The results show that organizations are increasingly realizing the necessity to utilize entrepreneurial orientation to make the most out of the knowledge generated from learning process.	The results show a moderated mediation in the relationship between the variables, which is rather hard to decipher for organizations and to implement in their day-to-day operations	The study tested the moderation effect of resources on the relationship between advanced manufacturing technology and performance of large manufacturing companies in Kenya

Table 2.1: Summary of Major Knowledge Gaps Cont…

Author and Year	Focus of Study	Methodology	Main Findings/Conclusions	Knowledge Gaps	Contribution of this Study
Kamasak (2017).	To study the effect of resources and capabilities on the performance of organizations with regard to their contribution to market share, sales turnover and profitability	A cross-sectional survey research design with a modified Galbreath and Galvin's (2008) questionnaire applied on 243 Turkish firms operating in different industries.	Intangible resources together with capabilities have a stronger relationship with organizational resources than tangible resources.	Study findings do not provide the explanation as to why intangible resources have a stronger relationship to performance compared to tangible resources	Having competitive advantage as one of the variables in the study, provides a way of identifying how resources impact organizational performance
Kotturu and Mahanty (2017)	To explore competitive priorities and factors affecting the relationship between SMEs and entry in global value chains.	A survey in the Indian automotive industry to investigate determinants of SME integration into global value chains using qualitative feedback loop analysis	Product quality standards is the most important priority for joining global production networks, followed by price competitiveness, timely delivery, innovativeness, manufacturing flexibility, service, and dependability	The study does not provide the basis on which organizations can achieve the identified factors to maintain competitive advantage and improved performance	This study used AMT to show that technology can help organizations to obtain the factors required to effectively compete in global markets and achieve improved performance.
Breznik and Lahovnik (2016)	Determine the Relevance of Dynamic capabilities in relation to a dynamic manufacturing environment	Case study on firms with the ability to change their resources and capabilities, to create competitive advantage in their operating environments	Dynamic capabilities enable organizations to improve their performance.	The study only considers the relationship of dynamic capability with performance.	This study investigated the role of competitive advantage and, organizational resources, with the underlying theory of RBV to show the relationship between manufacturing strategy (AMT) and organizational performance.

Table 2.1: Summary of Major Knowledge Gaps Cont…

Author and Year	Focus of Study	Methodology	Main Findings/Conclusions	Knowledge Gaps	Contribution of this Study
Abungu, Maingi, and Ombara, (2016)	Determine effect of AMTs on technical labour in manufacturing companies in Kenya	A conceptual study on manufacturing companies in Nairobi and Atsi River in Kenya,	AMT has a significant and positive impact on the performance of organizations and enhances staff retention	The sample size was limited to companies in Nairobi and Atsi River area which may not be generalised for the whole economic region of Kenya	This study sampled Large manufacturing companies in Kenya to provide representative results for the whole of the economic area, Kenya
José, Macarena, and Pedro (2016)	To explore the mediating role of internal and external integration on the effect of AMT on supply chain responsiveness	A sample of 441 Spanish industrial companies was used to test the model through structural equation modelling.	Supplementing Internal integration with external integration ensures that implementation of AMT results in improved responsiveness and organizational performance	The study uses only Internal integration and external integration which are some of the conditions that organizations use to improve SCM. Good forecasts and planning also lead to enhanced organizational performance.	This study addressed the effect planning using AMT as one of the factors used to improve SCM and improve performance
Dangayach and Deshmukh (2015)	Effects of Implementation of AMT in Indian Automobile Companies on performance	This was an exploratory survey study on the effects of AMT on performance in India	AMT is a source of competitive advantage in organizations and lead to improved performance	The study found AMT to be a source of competitive advantage, but did not show the relationship between resources in this relationship.	This study considered the role of organizational resources, on the relationship between AMT and performance besides competitive advantage .
Nyori and Ogola (2015)	AMT adoption in manufacturing companies in Kenya	A survey study on the adoption of AMT in Kenya	Clear benefits were observed in terms of competitive advantage and performance for the companies that had adopted AMT.	The study used only the relationship between AMT adoption and performance	Incorporation of organizational resources and competitive advantage on relation between AMT and performance

Table 2.1: Summary of Major Knowledge Gaps Cont……

Author and Year	Focus of Study	Methodology	Main Findings/Conclusions	Knowledge Gaps	Contribution of this Study
Rioba (2014)	Importance of manufacturing industry for the growth of Economies.	A survey study using in 42 companies using regression analysis to test Kaldor's' three growth laws in the manufacturing industry in Kenya	Manufacturing does not support the growth of the economy in Kenya	The study did not use manufacturing strategy to arrive at the stated conclusion	This study used AMT as the manufacturing strategy to relate the manufacturing industry with growth of the economy
Alnawaiseh, AL-Rawashdi, and Alnawaiseh, (2014).	Using value chain analysis to achieve competitive advantage	An empirical study using descriptive and statistical analysis that involved 93 companies	Manufacturing companies need to train their employees to appreciate and effectively use the data emanating from analysis of competitive advantage from the value chain	The study did not use manufacturing strategy and competitive advantage as variables of performance	This study used the concepts of the value chain analysis to increase knowledge on AMT as a manufacturing strategy, competitive advantage and performance
Kitenga and Kuria (2014)	Theoretical underpinnings of dynamic capabilities	Conceptual study design discussing the theoretical underpinnings of dynamic capabilities	Dynamic capabilities are an extension of the Resource Based View.	The role of manufacturing strategy to performance of organizations is not addressed	Provide the role of AMT as a manufacturing strategy and its effect on organizational performance
Srivastava1, Franklin, and Martinette, (2013)	Building a sustainable competitive advantage in companies	Exploratory study on sustainable competitive advantage in companies in developed countries	Organizations need to take long term perspectives in building resources and capabilities that provide the highest entry barriers that includes technology to forestall competition.	The study did not consider the context of developing Countries in terms of building competitive advantage	The study interrogated the resource utilization in developing companies and the impact it has on performance and competitive advantage

Table 2.1: Summary of Major Knowledge Gaps Cont……

Author and Year	Focus of Study	Methodology	Main Findings/Conclusions	Knowledge Gaps	Contribution of this Study
Kazoscu (2011).	To determine the role of strategic flexibility and resources in the choice of turnaround strategies	A conceptual study using two stages view of turnaround strategies consisting of retrenchment and recovery to determine both the focus of retrenchment and focus of recovery	Strategic alliances enabled firms to push the limits of technology by combining their technological and creative resources and by providing more access to capital as well as greater managerial capabilities.	The study did not consider other variables that organizations operating in declining economic conditions can use to navigate in their markets and regain their product positioning	This study used AMT together with the effects of competitive advantage from organizational resources to show that organizations gained pertinent benefits that can be used in turn around strategies
Bigsten, Kimuyu, and Söderbom (2010)	Government policies and how they affect the economy	An empirical study on the policies in the manufacturing sector in Kenya and their impact on the Economy	There is a need for the formal manufacturing sector to have a high rate of growth to enable absorption of the rapidly growing labour force in Kenya.	The study did not consider the strategy which the manufacturing sector would employ to increase its growth in the manufacturing sector	The study used AMT to show that policies in the manufacturing sector can improve performance and the growth economies
Percival and Cozzarin (2010)	To understand the differences between implementation on AMT returns between different organizations	The study used complementarity analysis of 26 AMT and 12 Management practices to determine the impact of organizational fit	Environmental differences if analysis on AMT dependencies is not included may lead to inconclusive or misleading results for the majority of senior managers engaging in strategic AMT investment decision making	Returns of AMT depend on factors like plant size and management involvement which generates differences in the observed return on investment, other factors also impact this relationship	This study used regression analysis to relate other factors competitive advantage and organizational resources besides management, engineering environment and technology used by organizations
Bridoux (2008)	Relationship between the resource-based view and organizational Performance	Conceptual study on the resource-based view of the firm	Organizations gain competitive advantage and improved performance using strategic resources	The study does not relate other variables like business processes and AMT strategy to performance	The study incorporated AMT as a manufacturing strategy on the effect of resources as moderating variables and competitive advantage on performance

Table 2.1: Summary of Major Knowledge Gaps Cont……

Author and Year	Focus of Study	Methodology	Main Findings/Conclusions	Knowledge Gaps	Contribution of this Study
Swink & Nair (2007).	To understand the relationship between Design manufacturing integration and process flexibility.	An empirical study using regression analysis to analyse data from 224 manufacturing companies	There is a positive relationship between the AMT groups of Design, Planning and Manufacturing technologies with performance	The study did not consider other variables in the relationship between AMT and performance	The study included the effect of organizational resources and competitive advantage in investigating the relationship between AMT and performance
Dı´az, lvarez Gil, and Machuca, (2005)	To determine the effect of Performance measurement Systems on AMT	A survey study carried out in Europe on performance measurement systems in the aeronautical industry	Financial and non-financial indicators can be used to measure performance in a company and a correlation exists between AMT, competitive advantage and performance	The study concentrated on one type of industry, the aeronautical industry and thus the findings could be biased	This study interrogated different types of manufacturing industries in Kenya
Ghani, Jayabalan, and Sugumar, (2002).	Determine the relationship between AMT, organizational structure and performance	A cross sectional survey carried out in 27 firms in India	AMT on its own leads only to modest benefits compared to the expected benefits and identifies mechanistic organizations as the cause of the discrepancy	The study is lacking in giving direction on what other factors can aid AMT to improve organizational performance	This study introduced other variables besides change in organizational structures to enable organizations implementing AMT to realize favourable benefits
Burcher, and Gloria (2000).	Determine the relationship between AMT investments and Competitiveness strategies in Organizations.	A case study involving four organizations in UK to demonstrate how AMT arise from business strategy to improve organizational performance	Investments in AMT need to be appraised over a period of time to determine the impact of the investment on performance and that AMT is positively related with delivery and flexibility	The study shows that AMT is positively related to delivery and flexibility but does not show how this relates to performance	The current study provided a basis of explaining how delivery and flexibility leads to improved organizational performance when organizations implement AMT

Table 2.1: Summary of Major Knowledge Gaps Cont……

Author and Year	Focus of Study	Methodology	Main Findings/Conclusions	Knowledge Gaps	Contribution of this Study
McDermott, and Stock, (1999)..	To determine the effects of Organizational Culture on the implementation of AMT	An empirical study together with regression analysis used to analyse data from 97 manufacturing plants	Cultural characteristics, as defined by the competing values model, are significantly related to AMT implementation outcomes	The study only considered culture as a variable on attaining the desired and expected benefits after implementing AMT	This study used competitive advantage and organizational resources to determining the relation between AMT and performance
Tracey, Vonderembse, and Lim, (1998)	To determine the relationship between investing in AMT and involvement of managers in strategy formulation and their effect on performance	A survey study using Linear structural equation analysis	Results show that Management involvement in strategy formulation leads to high organizational performance with investments in AMT as measured by customer satisfaction and marketing performance.	The study concentrated and confirmed the effect of manufacturing strategy using AMT on performance but did not show the role of competitive advantage and resources owned by the organization on performance after organizations implement AMT	This study added to the knowledge of the importance of involving managers in strategy formulation together with the contribution of organizational resources to performance after investing in AMT
Barney (1986)	Firm resources and sustained competitive advantage	Empirical Study	Competitive market imperfections, market entry barriers and other constraints require differing company resources	The immobility of resources for the development of successful strategy was not addressed	Identify the resources in an organization that lead to successful strategy
Michael Porter (1985)	Competitive Advantage	Conceptual Study	Sets out the concept of the value chain	Does not align the role of resources in manufacturing strategy to performance	Determine the role of resources in the relationship of AMT and performance

Source: Author (2019)

2.8 Conceptual Framework

The main theory used in developing the conceptual framework on which linkages in the conceptual framework are anchored was the resource-based view of strategy. The conceptual model, figure 2.1, provides inter-relationship among the four variables in the study: Advanced manufacturing technology, the independent variable; Organizational resources, moderating variable; competitive advantage, intervening variable and performance, dependent variable. The rationale for the framework was developed consistently in the literature review.

From literature review it has been shown that there is a strong significant association between the execution of advanced manufacturing technology and performance of manufacturing companies (Dangayach & Deshmukh, 2001). Other studies also confirm a significant relationship between advanced manufacturing technology and performance in small and medium enterprises in Nigeria (Dauda & Chukwudumeb, 2015). Integration of advanced manufacturing technology has also been shown in studies to have a significant relationship with performance (Rahman & David, 2009). Industries which have adopted advanced manufacturing technology have been shown to perform well.

Other research studies also show no direct relationship between advanced manufacturing technology and performance. This therefore calls for investigations into other variables as advanced by Swamidass, (2008) to further understand the relationship between advanced manufacturing technology and organizational performance. This study investigated other indicators that significantly affect the relationship between advanced manufacturing technology and performance in large manufacturing companies in Kenya.

The indicators that were used to measure advanced manufacturing technology included Product design technologies, manufacturing technologies and planning technologies. Both financial and non-financial indicators were used to measure performance according to Norton (2015). The indicators used in the study to measure organizational resources included both tangible and intangible assets while generic strategies which included cost leadership, differentiation and focus were used to investigate the mediation effect due to competitive advantage (Porter,1980).

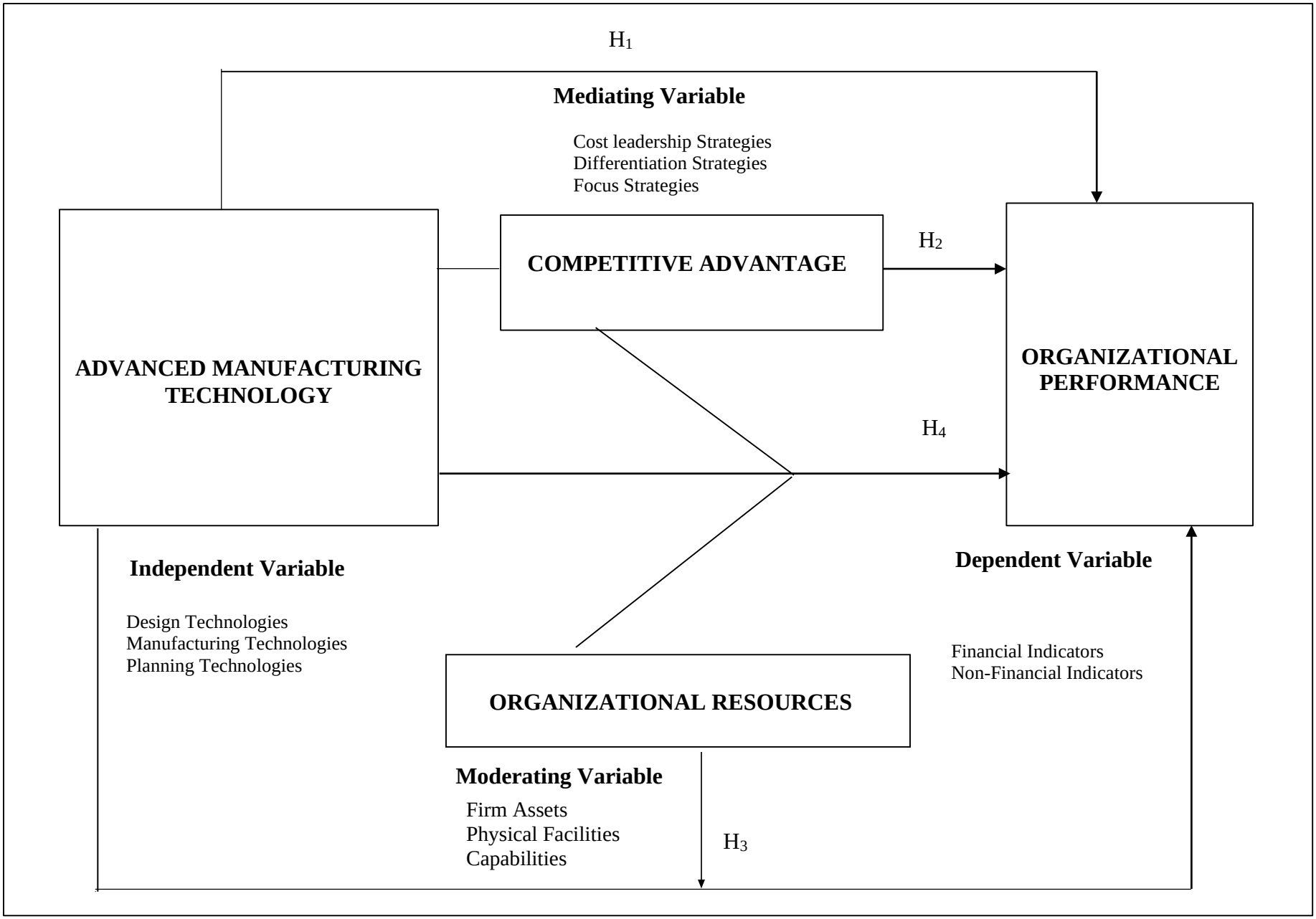

Figure 2.1: Conceptual Model
Source (Author) 2019

The research tested the mediation effect of competitive advantage on the relationship between advanced manufacturing technology and organizational performance of large manufacturing companies in Kenya. Mediating variables are relevant when a researcher wants to comprehend the process by which two variables are related (Mackinon, 2011). The mediation indicators included; cost leadership, differentiation and, focus generic strategies.

The study also tested the moderating effect of organizational resources on the relationship between advanced manufacturing technology and organizational performance of large manufacturing companies in Kenya. Moderating variables are important whenever a researcher wants to evaluate whether two variables have similar relation across groups (Mackinon, 2011). Moderation indicators included; organizational assets, physical facilities, and employee capabilities.

2.9 Conceptual Hypotheses

The study tested the following hypotheses:

H_1: There is a significant relationship between advanced manufacturing technology and performance of large manufacturing companies in Kenya.

H_2: Competitive advantage mediates the relationship between advanced manufacturing technology and performance of large manufacturing companies in Kenya.

H_3: Organizational resources moderate the relationship between advanced manufacturing technology and performances of large manufacturing companies in Kenya.

H_4: There is a significant joint effect of advanced manufacturing technology, competitive advantage and, organizational resources on performance of large manufacturing companies in Kenya.

This chapter presented a review of literature related to the study and research pertinent to the empirical studies on advanced manufacturing technology, competitive advantage, organizational resources and organizational performance. The theoretical foundation of the study was discussed with the resource-based view as the main theory guiding the study and the contingency theory of management as the second theory guiding the study. The relationship between competitive advantage and resources was expounded together with the three approaches of the contingency theory of management. This section also discussed the combined relationship between advanced manufacturing technology, competitive advantage, organizational resources and performance of large manufacturing companies in Kenya. The chapter discussed each of the variables in the concept model separately, and when combined to determine and show the effect of synergy between all the variables and justify why they were included in the model.

In order to show the gaps that are currently existing as elicited in chapter 1, the chapter used the existing empirical literature and reviewed it critically in relationship with the linkages between all the variables and the existing relationship among them. The existing gaps in the reviewed literature were identified and a summary provided within the chapter. The tentative analysis of the variables laid down a firm foundation for the research hypotheses towards the end of the chapter.

There were four hypotheses that were developed from the conceptual framework which was developed consistently from the literature review. The developed hypotheses sought to identify the relationship between advanced manufacturing technology and performance of large manufacturing companies in Kenya, the mediation role of competitive advantage on the relationship between advanced manufacturing technology and performance of large manufacturing companies in Kenya, the moderating role of organizational resources on the relationship between advanced manufacturing technology and performance of large manufacturing companies in Kenya and finally, the synergy between all the variables advanced manufacturing technology, competitive advantage, organizational resources and performance of large manufacturing companies in Kenya. This study is different from other studies since it used an integrated approach that would simultaneously consider all four variables in a single investigation.

CHAPTER THREE
RESEARCH METHODOLOGY

3.1 Introduction

The literature review used in the study was presented in the preceding chapter. Concepts on advanced manufacturing technology, competitive advantage, organizational resources and organizational performance were reviewed to understand the type of relationship that exist between variables of the study. The literature review provided insights on performance indicators. Further, it was observed that both financial and non-financial indicators can be used by manufacturing companies to track and measure their performance (Kaplan & Norton, 2015).

Strategic management theories that guided the study were discussed with a view to laying a foundation of understanding relationships between and among variables of the study in the current field of strategy. The study identified two theories of strategy, resource-based view and contingency theory that were used to discuss relationships between variables of the study. Subsequently, the conceptual model and four (4) hypotheses were developed to test the significance of these relationships.

This chapter presents the preferred methodology used by the researcher in this study. It includes the research philosophy and research design that was employed in the study. The philosophy used in a study depends on the belief held by the researcher towards meeting the objective of the study and to a great extent determines the research design. The population of the study was also determined in this chapter as well as the development of data collection tools and methods. Data collection instrument that was used in the study was also developed and later administered to the identified respondents in the study.

Operationalization of study variables which is key in developing data collection instruments as it determines data analysis methods to be used in a research study is presented in this chapter. According to Heale and Twycross, (2015) the quality of a research study is achieved through measurement of validity and reliability of data collected. Validity and reliability of the data in the study is presented in this chapter. The analytical models that were used in the study are also presented.

3.2 Research Philosophy

Research philosophy, which is a belief in the method the researcher prefers to employ in collecting and analyzing research data, is always incorporated in scientific investigations. According to Crotty (1998), the research philosophy adopted in research has a relationship to the methodology employed by the researcher. This relationship guides the researcher on how the data collected in the study should be analyzed. Al-Ababneh (2020) posits that research philosophy is directly linked to four steps that include epistemology, theoretical perspective, methodology and methods of the research. Saunders and Thornhil (2009) on the other hand link research philosophy to four steps that include ontology, epistemology, axiology and data collection techniques. Crotty (1998) suggests that both epistemology and ontology can be used interchangeably as they tend to emerge together.

Moser (2010) defines epistemology as the theory of knowledge. Epistemology provides the source of knowledge in a study, in relation to the true nature of knowledge, origin, and scope and can be classified into three distinct parts; 1) what knowledge consists of, which is the true justified belief in issues, 2) the basis of the knowledge as determined by pure reason, and 3) the extent of knowledge that is determined by objective or subjective facts. Crotty (1998) on the other hand defines epistemology as what is entailed in knowledge and deals with its nature, possibility, scope and general basis, while Tennis (2008) defines epistemology in relation to the knowledge validity claims and what would lead and assure a researcher that the source of evidence in research is acceptable.

Cunningham and Fitzgerald (1996) reckon that researchers can use epistemology to understand knowledge by considering seven key issues which relate to research. These issues are broadly embraced in three categories including 1) what should constitute or count as knowledge, 2) where is knowledge located, and 3) how is knowledge attained? Further, Cunningham and Fitzgerald (1996) infer from these three broad categories that truth does not exist in the mind of skeptics while in the mind of reductionists truth does exist albeit in very limited domain of operational statements that must be verified by data. Epistemology embodies pragmatism where knowledge is never certain and should be evaluated as a tool. Consequently, knowledge is considered to be anything that leads most people to achieve satisfaction of their needs, including the need for more knowledge.

Ontology is the study of being that is concerned with what actually exists in the world about which humans can acquire knowledge. Ontology helps researchers recognize how certain they can be about the nature and existence of objects they are researching. Ontology helps researchers to determine what 'truth claims' can they make about reality? Who decides the legitimacy of what is 'real'? How do they deal with different and conflicting ideas of reality?

Positivism, as one of the epistemological positions in qualitative research, focuses on the importance of being objective with the adduced evidence. According to Ritchie and Lewis (2003), the methods used in qualitative research aim at addressing research questions related to understanding the social phenomena and context of the study. Qualitative research methods are better at investigating complex relationships among and between variables as well as time related inquiries (Snape & Spencer, 2003). Positivism, allows the researcher to be objective while conducting the study as the facts encountered are very distinct. As a result, the researcher develops objective recommendations.

Emanating from the definition of epistemology, a researcher does not discover anything new but rather unveils what has been in existence all along. Besides the truth on a parameter being the same despite the prevailing environmental conditions, the variables being investigated through the people involved, are a fundamental part of objectivity in research. The truth can only be unveiled if the researcher employs appropriate methods to the study. These methods according to Ormston, Spencer, Barnard, and Snape (2014), should include careful objective and direct observation without any undue influence using deduction that emanate from abstract positions.

Positivism as a research philosophy is regarded as being objective, value-free, can be generalized using a sample that is representative of the population and replicated in different contexts (Wellington, 2000). Therefore, positivism is regarded as a synonymous scientific method in carrying out qualitative investigations by researchers. Nevertheless, positivism has often been criticized as being soft and unscientific (Denzin & Lincoln, 2000). Kalelioglu (2020) observes that for positivism to be considered as a scientific research philosophy and as one of the methods used to conduct scientific research, it must assure the researcher on the possibility of replicability and universality.

Post-positivism has been presented as a second version of the positivist research philosophy following the criticism of the positivist thinking and tradition (Ormston *et al*, 2014). Critiques view the positivist philosophy as being rigid and not amenable to change despite the normal and natural changes that are accustomed to life. Proponents of the second view of positivism rely on using deductions and conclusions derived from testing propositions instead of relying only on careful observation. Further, this school of thought recommend for the propositions to be empirical as opposed to the notion of using observations alone. The third school of thought emanating from post-structuralism and deconstruction are the other basis on which positivism in qualitative research has been criticized (Denzin & Lincoln, 1994). The critiques of the positivist view find it difficult to clearly separate and describe the concept of reality as espoused by positivism and meaning (Denzin & Lincoln, 1994).

Therefore, the critiques of the positivism approach in qualitative research hold the view that a researcher is not capable of generating absolute relationships between variables as it is bound to suppress diversity. Denzin and Lincoln (1994) in their discussion on positivism observed that it resulted in a crisis of some sort for the findings of a research as they cannot be uniform and globally acceptable due to differences that are expected due to context and concept of the research. Yet another challenge on positivism emanates from the critical theory in the form of Neo Marxism which encompasses feminism, and race research. Neo Marxism maintains that material condition, social, political, gender, and cultural factors have a major influence on people's lives and therefore how they view the world.

Neo Marxism theory does not contemplate research to produce findings that are independent of bias from political, race, class or gender as these factors are ever present if they have been determined to be a primary focus in the data for the research. Emanating from this theory, it is not possible for a researcher to be objective and fail to be influenced by bias resulting from this type of research environment, in arriving at conclusions and deductions. Bowles and Klein, (1983); Oakley, (1981); Roberts, (1981) responded to these challenges by advocating for greater equality between the researcher and research participants especially in feminist research as there appeared to be a power imbalance in the way research was structured and conducted in environments where politics, race, class or gender factors are dominant.

The observed power imbalance puts in question the specific role of both the researcher and the respondents in the study. The imbalance is addressed by specifying the role of each participant in the study. Reason, (1994); Whyte, (1991); Reason and Rowan, (1981) recommend that since social research has become a collaborative process, the different roles for all individuals involved in a study need to be clearly specified especially with qualitative studies which have embraced new ways of involving the study population in the research. The perspective of the researcher is still important in any research as they are responsible for the accuracy of the findings and subsequent recommendations adduced from the research data.

While epistemology is the study of knowledge, Ontology is the study of being and form of existence. In a research, ontology is concerned with what actually exists in the world about which researchers can acquire knowledge (Moon & Blackman, 2014). Researchers use ontology in their investigations to understand how certain they can be about what they are investigating. Bryman (2008) conceptualized ontology in a social perspective as a philosophical consideration in research that concerns the nature of social entities. Using the perspective of Bryman (2008), ontology leads a researcher to identify social entities that can be objective and therefore exist independently from social actors or those that are social constructions in themselves built up from the perceptions, actions and interpretations of the individuals in society. Ormston et al (2014) assert that ontology asks if a social reality exists independently from human conceptions and interpretations.

Chamberlayne, Bormat, and Wengraf, (2000); Roberts, (2002) advocates for research participants telling their own story within their own context directly, to provide greater understanding of the phenomena being researched while generating research evidence. Bogdan and Taylor, (1975); Cicourel, (1964); Glaser and Strauss, (1967) have stressed the importance of positivism in understanding qualitative research outcomes through rigorous data collection and analysis. Finally, positivism and post-positivism views differ on the accuracy level with which reality can be known with certainty. This research employed the positivist research philosophy as it was determined to be the most suitable philosophy to enable the development and testing of the research hypotheses.

3.3 Research Design

There are various definitions of research designs depending on the nature of the study being undertaken. Research design according to Lewis, Clayden, O'Connor, Mitchell, and Sanderson, (2000) is a plan for a study which provides the researcher with a complete methodology for collecting data. Moser and Kalton (1979) on the other hand define it as a plan used by the researcher to identify the main focus of the study involving subject of the study, research sites, and data collection procedures for purposes of answering the research question. A comprehensive research design which should also be appropriate to the study objectives provides results that are credible. O'Connor and Molloy (2001) define it as a planned strategic tool that a researcher uses as a guide to the research, to develop an action plan or implementation road map for the research strategy

The researcher adopted a research design that led to the study incorporating all the components in the investigation, to answer the research problem. Akhtar (2016) identifies four main research designs: exploratory, descriptive, explanatory and experimental. These research designs can be further expanded into twelve specific designs according to the University of Southern California libraries (2016). These are; Action, case study, causal, cohort, cross-sectional, descriptive, experimental, exploratory, historical, longitudinal, meta- analysis, and observational research design. This study employed both the cross sectional and descriptive research designs using the experience of Awino and Gituro (2011); Chiyonge-Sifa (2009); Pertusa-Ortega (2009) and Kariuki (2014) who have used cross-sectional survey before and found it appropriate and reliable to use in similar studies.

Cross-sectional research design was adopted in the study because of the three distinctive features that were important to the study, namely: a) no specific time frame; b) relies on the current status of the subjects involved in the study; and c) random allocation is not used in the selection of groups in the study. According to Lavrakas (2006) cross-sectional surveys capture the current status of the population of interest from which data is collected and allow the researcher or other researchers in different contexts to repeat the study periodically. However, when the study is repeated using the cross-sectional design, it is advisable that respondents to the earlier surveys are not sampled again to avoid bias or low response rates from participants (Shafiei, Biggs, 2018).

A descriptive research design describes the phenomenon completely together with all its related characteristics. This helps the researcher know the cause and mechanism of the phenomenon but cannot conclusively ascertain all the reasons for the effects on the specific findings for a particular research problem. This research design is used to collect and collate information which leads to better understanding of the existing status of the phenomena. Further, it enables the researcher to describe all the available detailed information with respect to variables of the study. The advantages associated with this research design include the opportunity to observe the subject in its normal environment (Mustafa, 2010).

Other advantages of descriptive research design include: it may be used as a pre-cursor to employing quantitative research designs in subsequent studies enabling identification of variables that can undergo quantitative testing and yield large and rich amounts of data used in providing useful recommendations to be used in practice after carrying out detailed analysis (Jackson, 2009). Descriptive research designs enable the researcher to provide summary reports of the research including; measures of central tendency for the variables in the study such as the mean, median, mode, deviation from the mean, variation, percentage, and correlation between variables but cannot be used to draw inferences between the variables in the study (Crotty, 1998). The limitations of the descriptive research design can be useful in developing a more focused study.

The limitations for descriptive research designs include the following; the researcher cannot use the results to derive a definite finding or fail to reject a hypothesis; It is not possible to replicate the results of a study as they often just observe the parameter under investigation, and the descriptive function of research is heavily dependent on instrumentation for measurement and observation. The other limitation is that researchers cannot use it to create a causal relationship between the variables in the study hence, it has a low requirement for internal validity (Crotty, 1998). This design was considered appropriate for the study due the need to collect data from the target organizations and carry out data analysis to test the developed hypotheses of the study. This approach enabled the researcher to develop an appropriate tool for data collection that led to understanding the relationships among and between the study variables. This study used both the descriptive research and the cross-sectional survey design.

3.4 Population of the Study

Population in research, is defined as a group of individuals or objects with a common bearing to the main focus of the investigation. The researcher needs to identify beneficiaries of the findings of research since this determines the composition of the population. Research population should be well defined, noting the common binding characteristic to avoid ambiguity when collecting data (Singleton, & Straits, 2010). Populations for research may be inordinately large and researchers use samples representing the population in all aspects to reduce costs, while still being in control of the study.

The population of this study comprised large manufacturing companies in Kenya that were members of the Kenya Association of Manufacturers (KAM) as at December 31st 2020. The target population in the study comprised 55 companies, selected from the list obtained from the database of KAM. The target population, was made up of companies with more than 100 employees that had been in operation for at least 3 years, having a working capital of Ksh.100 million and which had implemented design technologies, manufacturing technologies and planning technologies in their production processes. The list of the 55 companies used in the study is attached in appendix III.

In this study, companies with an annual turnover of over KSh. 100 million, employing 100 employees, with a registered capital of over Ksh. 100 million were considered as large manufacturing companies in Kenya. The other criteria was the ability of the company to invest in advanced manufacturing technology and the period that the company had been in operation which was taken as 5 years or above as at the time of data collection. MSME's companies were excluded in this study.

Large manufacturing companies in Kenya have been observed to contribute approximately 80% of the GDP from the manufacturing sector. According to Singleton and Straits (2010), researchers need to carry out sampling of the target population to have a small representation of the population. There are two types of sampling methods: a) Probability sampling which involves random selection, allowing the researcher to make strong statistical inferences about the whole group and b) non-probability sampling which involves non-random selection based on convenience or other criteria, allowing easy collect data. This was a census study.

3.5 Data Collection

Primary data which was collected using a self-administering structured questionnaire and secondary data on the financial performance was used in the study. The financial data was from the organization's annual financial reports and from the annual reports and Capital Markets Authority reports. The researcher used the Likert scale to rate the responses for the primary data. Healy (2012) recommends the use of structured questionnaires for interviews of more than thirty (30) respondents and may be carried out over the telephone, face to face, e-mail, or through mail. The questionnaire included open-ended questions, and interval scale questions anchored on five-point Likert type scale items.

The questionnaire used in the study was structured into five parts to capture primary data relating to the respondent and general organization's information, advanced manufacturing technology, competitive advantage, organizational resources and non-financial indicators on organizational performance. Secondary data on performance collected included gross revenue, net profit for a period of three years between 2015 and 2017. Advanced manufacturing technologies section of the questionnaire was divided into three segments, design technologies, manufacturing technologies and planning technologies. The questions on competitive advantage were developed from Porters (1998) generic strategies on cost leadership, differentiation and focus strategies. Suggestions recommended by Barney (1991) in the model developed on firm resources and sustained competitive advantage was used to develop the questions on the resources, assets, physical facilities and employee capabilities in the organizations. The final part of the questionnaire contained non-financial performance indicators on customer satisfaction and employee retention.

A total of 55 sets of questionnaires were distributed to respondents for data collection by the Research Assistant. One questionnaire was presented in each of the 55 companies to the Manufacturing Director or Senior Managers in the Technical Department. The questionnaires were administered by the Research Assistant to respondents in management positions in the technical department because they were assumed to have the widest and deep understanding of the whole organization policies and strategies. This is supported by Hambrick and, Mason, (1984) who posited that organizations are a reflection of their top echelon.

Once the respondent had been identified from the customer care desk, they were physically contacted and given the questionnaire or alternatively the questionnaire was dropped and later picked from the customer care office. A letter of introduction from the University of Nairobi accompanied the questionnaire which showed the identity of the researcher and authority given to the researcher to collect data from the organization. The researcher also used other personal networks through friends and colleagues to reach the respondents where a delay was observed. Telephone reminders were done where necessary to encourage the respondents to fill and return the questionnaire.

The response rate of the questionnaire distributed to the respondents was 81.8%. The response rate is the ratio of questionnaires received back from the respondents to the total number of questionnaires distributed to the eligible respondents in the selected sample. According to Johnson and Owens (2003), response rates in research should have a definition to enable the full understanding of its import. In this study, the response rate is determined by the number of fully completed questionnaires received from the respondents compared to the total number dispatched to the respondents. Draugalis, Coons and Plaza (2008) recommend that every respondent in the study sample should be accounted for clearly. Very low response rates for individual items on a questionnaire can cause a problem during data analysis, particularly if they represent important study variables. For this study, the 10 missing respondents were due to blank and unfilled questionnaire (a total of 3), respondents being out of office during the data collection period after receiving questionnaires (a total of 4), and lack of communication and feedback with respondents (a total of 3).

Fowler (2002) recommends that response rates should be over 70% although there is no agreed-upon standard for acceptable response rates. Bailey (1987) recommends the minimal acceptable response rate of 75%. Schutt (1999) on the other hand reckons that response rates below 60% is unacceptable, though Babbie (1990) stated that a 50% response rate was adequate. Hence, the response rate in this study of 81.8% meets the recommendation by Fowler (2002). Credibility of survey research is key to acceptability of the results from the study. Therefore, survey research should meet a minimum threshold on response rates, scientific rigor, and the samples representing the population well to generalize the results (Draugalis, Coons and Plaza, 2008).

3.6 Operationalization of Key Study Variables

Tariq (2015) affirms that research requires strong theoretical framework and methodology. To derive the proper research framework, the theory and research must be linked, and the importance of theory in the research must not be underestimated. Daniel (2012) on the other hand states that the theory factor must not be ignored while deriving the theoretical framework. The operationalization of the variables must be linked with the theory and bounded with the experiments in order to find the accurate results. To understand the difference between the variables, the research difference first must be understood to use the variables properly within the research framework.

Operationalizing of the study variables involves finding a measurable index that is valid and quantifiable for all the study variables. The index should also be able to be manipulated at two or more levels. This is important as it is understood that not all variables in a study are measurable especially when they are subjective compared to objective variables which are easily measurable. Operationalization of variables helps the researcher to define the exact variable increasing the quality of variable and efficiency of design. The clarity of the study hypotheses is improved besides being made strong by operationalizing the study variables. A failure in the process can lead to non-standardized variables with errors in the research.

This study had four variables namely; advanced manufacturing technology as an independent variable, competitive advantage was the intervening variable between the independent and dependent variable, organizational resources was the moderating variable between the independent and dependent variables while organizational performance which was the dependent variable was the fourth variable of the study. These variables were operationalized as indicated in table 3.1. The following dimensions were used to operationalize the study variables: independent variable; design technologies, manufacturing technologies and planning technologies; organizational performance; financials, customer satisfaction and employee retention; competitive advantage; cost leadership, differentiation and focus generic strategies while the dimension used to operationalize for organizational resources were assets, physical facilities and employee capabilities.

Table 3.1: Operationalization of the Key Variables of the Study

Variable	Dimension	Definition of Variable	Operational Indicator	Measurement	Section of Questionnaire	Supporting Literature
Advanced Manufacturing Technology (AMT)	Design Technologies	The variable identifies the production processes that relate to product innovation, definition, design, and processing information functions.	Utilization of the following design technologies: ⇒ Computer aided design (CAD), ⇒ Computer aided engineering (CAE), ⇒ Computer aided process planning (CAPP), and ⇒ Group Technology (GT)	5-point Likert type scale	Part II	Dangayach, G. S., and Deshmukh, S. G., (2015), Nyori, G. M., and Ogola, J.M., (2015), Rioba, M. E., (2014). Swamidas and Kotha (1997)
	Manufacturing Technologies	The variable identifies production processes that are used on the shop floor	Utilization of the following manufacturing technologies: ⇒ Computer Aided Manufacturing (CAM), ⇒ Computer Integrated Manufacturing (CIM), ⇒ Computer Numerically Controlled Machines (CNC), ⇒ Numerically controlled machines (NC), ⇒ Flexible Manufacturing Systems (FMS), ⇒ Computer Aided Inspection (CAI), ⇒ Industrial Robots (IR) ⇒ Automated Guided Vehicles (AGV), ⇒ Automated Storage and Retrieval Systems (AS/RS), and ⇒ Program Logic Controllers (PLC).			

Table 3.1: Operationalization of the Key Variables of the Study.....Contd

Variable	Dimension	Definition of Variable	Operational Indicator	Measurement	Section of Questionnaire	Supporting Literature
Advanced Manufacturing Technology (AMT)	Planning Technologies	The variable identifies technologies that control and monitor the material flow in the production process.	Utilization of the following planning technologies: ⇒ Materials Requirement Planning (MRP), ⇒ Manufacturing Resource Planning (MRPII), ⇒ Computer Preventive Maintenance Planning (CPM), ⇒ Just in Time (JIT), ⇒Management Information Systems (MIS), ⇒Entreprise Resource Planning (ERP), ⇒ Total Quality Management (TQM), and Customer Relationship Management (CRM)	5-point Likert type scale	Part II	Dangayach, G. S., and Deshmukh, S. G., (2015), Nyori, G. M., and Ogola, J.M., (2015), Rioba, M. E., (2014). Swamidas and Kotha (1997
Competitive Advantage	Cost leadership	The variable identifies a set of production processes that lead to manufacturing of goods or services acceptable to customers at low cost	Developing strategies that lead to: ⇒ High process engineering skills, ⇒ Design of products, ⇒ Inexpensive capital, ⇒ Supervision of labor, ⇒ Production cost control, ⇒ Employee Incentives, ⇒ Manufacturing cost management	5-point Likert type scale	Part III	Ansoff, H. I., (1965), Awino, Z. B., Wandera, R., M., Imaita, I., and K'Obonyo, P. (2002),

Table 3.1: Operationalization of the Key Variables of the Study.....Contd

Variable	Dimension	Definition of Variable	Operational Indicator	Measurement	Section of Questionnaire	Supporting Literature
Competitive Advantage	Differentiation	The variable identifies ability to manufacture products or service with special appeal to different customers	Implementing strategies that enable organization to achieve superior outcomes in: ⇒ Customer service, ⇒ Unique products, ⇒ Reputable brand name, ⇒ Use of technology, ⇒ Distributorships, ⇒ Customer loyalty	5-point Likert type scale	Part III	Barney, J. B., (1995). Porter, M. E., and Kramer, M. R. (2006). Prahalad, C. and Hamel, G., (1990).
	Focus	The variable identifies ability to produce products to meet the changing needs of customers	Having strategies that lead to: ⇒ Small niche market, ⇒ Small target market			
Organizational Resources	Firm Assets	These are resources with economic value owned by the organization with the potential of providing a future benefit.	Assets include ⇒ Pooling of resources and expertise, ⇒ Organizations Inventory, ⇒ Owning a reputable brand name, ⇒ Owning Patents, ⇒ Having strategic partnerships, ⇒ Location of operation ⇒ Ownership of Trade marks	5-Point Likert type scale	Part IV	Bridoux , F. (1997). Ainuddin, R. A., Beamish, P. W., Hulland, J. S., & Rouse, M. J. (2007)

Table 3.1: Operationalization of the Key Variables of the Study..... Contd

Variable	**Dimension**	**Definition of Variable**	**Operational Indicator**	Measurement	**Section of Questionnaire**	**Supporting Literature**
Organizational Resources	Physical facilities	These are the resources used to carry out manufacturing	The operational indicator used in the study includes: ⇒ Offices ⇒ Production facilities, ⇒ Land, ⇒ Equipment replacement strategy	5-point Likert type scale	Part IV	Bridoux , F. (1997). Ainuddin, R. A., Beamish, P. W., Hulland, J. S., and Rouse, M. J. (2007)
	Capabilities	The ability of the organization to effectively manage resources to gain competitive advantage.	The company's organizational capabilities that focus on meeting the customer demand including: ⇒ Human resource development, ⇒ Industry technological needs, ⇒ Training policy ⇒ HR development policy, ⇒ Performance management system, ⇒ Employees Skills development, ⇒ Coaching at the workplace			
Organizational Performance	Financials	The financial performance of the organization	⇒ ROA (Gross revenues/Average Assets) ⇒ ROI (Gross Profit /Value of investments) ⇒ ROE (Net Income/ (Assets - Debt)	From the financial statements of the organization for the last three years	Part V	Bridoux , F. (1997). Christensen, Raynor, M.E., McDonald, R. (2015). Jusoh, R., & Parnell, J. A. (2008).

Table 3.1: Operationalization of the Key Variables of the Study.....Contd

Variable	Dimension	Definition of Variable	Operational Indicator	Measurement	Section of questionnaire	Supporting Literature
Organizational Performance	Customer satisfaction	This is a measurement to determine how well the organization is meeting the customer needs	The organization's ability to manage: ⇒Customer complaints, ⇒Professionalism in dealing with customers, ⇒Customer Technical Support, ⇒Having Superior products compared to competitors in the market, ⇒Products meet customer needs in terms of quality and performance ⇒Delivery Timeliness, ⇒Value for money	5-point Likert type scale	Part V	Dı´az, M.S., lvarez Gil, M. J., and Machuca, J.A. D., (2005). Theodoroua, P. & G. Florou, (2008
	Employee Retention	The efforts by organizations to retain skilled employees in their workforce.	The strategies and measurement of actions related to retaining employees that include: ⇒Employee satisfaction, ⇒Positive external communication, ⇒Communication of organization Mission Statement, ⇒Job alignment, ⇒Effective organizational Communication, ⇒Availability of effective working tools ⇒Employee recognition			

Source: Author (2019)

3.7 Data Analysis

Data analysis in qualitative research is the process of analyzing and attaching meaning that is relevant to the research from all the information provided by the participants in the research. The results from observing the objects in the research also forms part of data analysis (Cohen et al., 2007). Nieuwenhuis (2007) defines qualitative data analysis which includes all the steps from developing the instrument to collect the data to documenting the collected data as an iterative process to build quality into the research. Gibbs (2007) on the other hand describes qualitative data analysis as a process of using appropriate and acceptable methods to transform collected data from a study sample to be used by the researcher to arrive at findings that can be generalized across the whole population.

Marshall and Rossman (1999) on their part state that qualitative data analysis involves using a manageable process to generate logical and general statements about variables. Muijs (2011) provides the difference between quantitative and qualitative data analysis by stating that qualitative methods aim at providing meaning of relationships between particular events of interest. Creswell (2013) extended this definition of data analysis by explaining meaning as the objective of the researcher by establishing patterns and themes using both inductive and deductive procedures. This involves using logic to transform the raw information to identify patterns and relationships to answer the research objective.

When engaging in qualitative data analysis, the researcher identifies recurring features, different steps, procedures and processes in the study. Khan (2006) has identified organizing collected data as the first step in data analysis. Different methods are used to organize the data depending on the research philosophy and data collection methods employed by the investigation. Data analysis can only proceed after collected data has been successfully organized (Khan, 2006). When analyzing the data, the researcher describes different aspects of the study. The third stage which is interpretation of the data involves explaining the findings, attaching significance of the results to the study and developing patterns into an analytic framework, (Patton, 2002). As the researcher carries out these steps in analyzing data and attaching meaning to the collected data, it is important to take note of; the setting of the study environment, individuals or objects being studied, and the purpose of any activities.

The study adopted a positivist philosophy which was used to guide data analysis. Positivism holds that hypothesis testing using quantitative techniques be done to either reject or fail to reject the hypotheses developed for the study (Stiles, 2003). Before data analysis was done, preliminary tests on data reliability and validity were conducted. Reliability is the ability with all other things being similar, that a respondent to a questionnaire should get a similar score on a questionnaire if they complete the same questionnaire at two different points in time, (Cronbach, 1951). In statistical terms, reliability is premised on the idea that individual items (or sets of items), in similar conditions and environment should produce outcomes consistent with the overall questionnaire (Creswel, 2014). Cronbach alpha coefficient was performed to test the reliability of the data.

In order to use regression analysis to test the relationships between the variables in the study, the main assumptions of regression analysis, normality and collinearity were tested using the Kurtosis and skewness tests. In order to establish the relationship between the four variables used in the study; advanced manufacturing technology, competitive advantage, organizational resources and performance of large manufacturing companies in Kenya; descriptive statistics which included; frequencies and percentages, mean scores, standard deviation and coefficient of variation, were used.

Inferential statistics involving the determination of correlation, simple linear, stepwise and multiple regression analysis were also carried out to test the four hypotheses that were developed in the study. Inferential statistics were used to include deductions made that extended beyond the immediate data alone both in terms of context and concept. The statistical significance of each hypothesized relationship was interpreted based on model fitness (R^2) which provided an indication of how much the dependent explained the observed results, analysis of variance (ANOVA, F) indicated the link that a set of scores had to the mean of the sample, student t-test, Beta coefficients (β) and Probability (p) values which provided the significance of the variables and hence enabled the researcher to reject or fail to reject the hypothesis. Data is presented in the form of tables and figures. The variables of the study were within interval and ratio scales and the analysis was carried out using SPSS. The specific regression models used in the study are presented in table 3.2.

Table 3.2: Study Objectives, Hypotheses and Analytical Models

Objective	Hypotheses	Analytical model	Interpretation
Objective 1: Determine the effect of advanced manufacturing technology (AMT) on Performance (P) of Large Manufacturing Companies in Kenya (LMC) in Kenya	**H_1:** There is a significant relationship between AMT and Performance of large manufacturing companies in Kenya	Simple régression analysis: **$Y=\beta_0+\beta_1 AMT+\varepsilon_1$** Where; **Y** = Performance of large manufacturing companies in Kenya (P); **AMT** = Advanced Manufacturing technology; **β_0** = Regression Constant **β_1=** Coefficient of AMT	⇒ R to assess the strength of the relationship between AMT and performance of large manufacturing companies in Kenya ⇒ R^2 to assess how much change in Performance is due to AMT in large manufacturing companies in Kenya; ⇒ F- test: To assess the overall robustness and significance of the simple regression model; ⇒ t – test to determine the significance of AMT; ⇒ P value to be used to test the hypothesis. ⇒ The value for β_1 gave an indication on the change in Performance for each incremental change in AMT
Objective 2: Determine the mediation role of competitive advantage on the relationship between AMT and Performance of LMC in Kenya	**H_2:** Competitive advantage mediates the relationship between AMT and Performance of LMC in Kenya (Use Baron and Kenny 4-Step Model)	**Step I: Simple regression analysis** **$Y=\beta_2+\beta_3 AMT+\varepsilon_2$;** Where; **Y** = Performance of large manufacturing companies in Kenya (P); **AMT**= Advanced Manufacturing technology; **β_2**, = Regression constants; **β_3**=Coefficient of AMT	**Step I:** Simple regression with advanced manufacturing technology predicting performance of large manufacturing companies in Kenya. Proceed to STEP II if the results establish that an effect to be mediated exists if the p-value for the effect of advanced manufacturing technology on performance of large manufacturing companies in Kenya is significant.

Table 3.2: Study Objectives, Hypotheses and Analytical Models…….Contd

Objective	Hypotheses	Analytical model	Interpretation
Objective 2: Determine the mediation role of competitive advantage on the relationship between advanced manufacturing technology and Performance of large manufacturing companies in Kenya	**H2:** Competitive advantage mediates the relationship between AMT and Performance of large manufacturing companies in Kenya (Use Baron and Kenny 4-Step Model)	**Step II: $CA = \beta_4 + \beta_5 AMT + \varepsilon_3$;** Where; **CA** = Competitive advantage; **AMT**= Advanced Manufacturing technology; **β_4,** = Regression constants; **β_5** =Coefficient of AMT	**Step II:** Simple regression with advanced manufacturing technology predicting competitive advantage (mediating variable). Proceed to STEP III if the results of the analysis confirm that advanced manufacturing technology is correlated with competitive advantage.
		Step III: $Y = \beta_6 + \beta_7 CA + \varepsilon_4$; Where; **CA** = Competitive advantage; **Y**= Performance of large manufacturing companies in Kenya; **β_6,** = Regression constants; **β_7** =Coefficient of competitive advantage	**Step III**: Simple regression with performance of large manufacturing companies in Kenya predicting competitive advantage. Proceed to STEP IV if the results show that the effect of competitive advantage on performance of large manufacturing companies is significant.
		Step IV: $Y = \beta_8 + \beta_9 CA + \beta_{10} AMT + \varepsilon_5$ Where; Y= Performance of large manufacturing companies in Kenya; CA = Competitive advantage; AMT = Advanced manufacturing technology β_8 = Regression constants; β_9, = Coefficient of competitive advantage β_{10} = Coefficient of AMT	**Step IV:** Multiple regression with competitive advantage and advanced manufacturing technology predicting performance of large manufacturing companies in Kenya. To establish that competitive advantage completely mediates the relationship between advanced manufacturing technology and performance of large manufacturing companies in Kenya, the effect of advanced manufacturing technology on performance of large manufacturing companies should be zero when competitive advantage is controlled.

Table 3.2: Study Objectives, Hypotheses and Analytical Models…….Contd

Objective	Hypotheses	Analytical model	Interpretation
Objective 3: Establish the moderation role of Organizational resources (OR) on the relationship between advanced manufacturing technology and performance of large manufacturing companies in Kenya	**H_3:** Organizational Resources moderates the relationship between advanced manufacturing technology and performance of large manufacturing companies in Kenya (Use Baron and Kenny 3-Step Model)	Three step forward moderating model: **Step I:** **$Y = \beta_{11} + \beta_{12} AMT + \varepsilon_6$;** Where; **Y** = Performance of large manufacturing companies in Kenya (P); **AMT**= Advanced Manufacturing technology; **β_{11}** = Regression constant β_{12} = Coefficient of advanced manufacturing technology	**Step I**: Simple regression with advanced manufacturing technology predicting performance of large manufacturing companies in Kenya. Proceed to STEP II if the results establish that an effect to be moderated exists if the p-value for the effect of advanced manufacturing technology on performance of large manufacturing companies in Kenya is significant.
		Step II:: **$Y = \beta_{13} + \beta_{14} AMT + \beta_{15} OR + \varepsilon_7$** Where; **Y** = Performance of large manufacturing companies in Kenya (P); **AMT**= Advanced Manufacturing technology; **OR** = Organizational resources **β_{13}** = Regression constant **β_{14}** = Coefficient of advanced manufacturing technology β_{15}= Coefficient of organizational resources	**Step II**: Enter OR in the regression model. This is a multiple regression model, Organizational resources, advanced manufacturing technology and performance of large manufacturing companies in Kenya. Proceed to step III if the relationship between advanced manufacturing technology, organizational resources and performance of large manufacturing companies in Kenya is significant.

Table 3.2: Study Objectives, Hypotheses and Analytical Models…….Contd

Objective	Hypotheses	Analytical model	Interpretation
Objective 3: Establish the moderation role of Organizational resources (OR) on the relationship between AMT and performance of LMC in Kenya	**H_3:** Organizational Resources moderates the relationship between AMT and performance of LMC in Kenya (Use Baron and Kenny 3-Step Model)	**Step III:**: $\mathbf{Y = \beta_{16} + \beta_{17} AMT + \beta_{18} OR + \beta_{19} (AMT*OR) + \varepsilon_8}$ Where; **Y** = Performance of large manufacturing companies in Kenya (P); **AMT**= Advanced Manufacturing technology; **OR** = Organizational resources β_{16} = Regression constant β_{17} = Coefficient of advanced manufacturing technology β_{18} = Coefficient of organizational resources β_{19}= Coefficient of the interaction term	**Step III:** Advanced manufacturing technology. Organizational resources, interaction term (AMT*OR) and performance of large manufacturing companies in Kenya. Moderation is confirmed if the relationship between advanced manufacturing technology and organizational resources is significant.
Objective 4: Establish the effect of the combined research variables on performance of LMC in Kenya	**H_4:** There is a significant joint effect by the study variables on performance of LMC in Kenya.	Multiple Regression Analysis: $\mathbf{Y=\beta_{20} + \beta_{21} AMT + \beta_{22} OR + \beta_{23} CA + \varepsilon_4}$ Where; Y= Organizational Performance (P); AMT = Advanced Manufacturing technology; OR = Organizational Resources; CA= Competitive advantage,	Multiple regression with AMT, OR and CA predicting performance (R^2 to assess how much change in performance is due to the joint effect of AMT, OR and CA; β_{21}, β_{22} and β_{23}, gave an indication on the change in performance for each incremental change in AMT, OR and CA. p- value to be used to test the hypothesis

Source: Author (2019)

This chapter provided a general overview of the methodology used by the researcher in this study. The research used the positivist research philosophy as this was the most suitable to enable the development and testing of the developed hypotheses to test the relationship between advanced manufacturing technology, competitive advantage, organizational resources and performance of large manufacturing companies in Kenya.

The cross-sectional research design was adopted and presented in the chapter due to the three distinctive features that were deemed to be important for the study. The three features for the cross- sectional design that were considered for the research include: no time dimension, reliance on existing difference, and selection of groups based on existing differences. The purposeful sampling method was used to select 55 manufacturing companies that were members of Kenya Association of Manufacturers and/or listed in the manufacturing sector of the Nairobi securities exchange database. The other criterion used to get a homogenous population was to select companies with more than 100 employees with a turn over exceeding KSh. 100 million.

The chapter presented the instrument used for data collection which was a structured questionnaire that had five sections to collect primary data for the study. The five sections of the questionnaire related to the five variables in the study. A total of 55 questionnaires were distributed to the respondents who were senior Managers in the technical department of the companies by the researcher. Operationalization of the key study was done by developing a dimension, definition, operational indicator, measurement of the variable and identifying the section of the questionnaire relating to the particular variable and the supporting literature.

The chapter also presented the methods to be used in carrying out data analysis. Both descriptive and inferential statistics were used to analyze the data using linear and multiple regression models. A summary of the study objectives, hypotheses and analytical models that was used in the study was presented in the chapter. The analytical models included; the four-step regression model which was used to test the mediation effect of competitive advantage on the relationship between the independent and dependent variable; the three-step moderation model used to test the moderating effect of organizational resources on the relationship between advanced manufacturing technology and performance of large manufacturing companies in Kenya. Linear and multiple regression models which were used in the study were also presented in the analytical model summary.

CHAPTER FOUR
DATA ANALYSIS, FINDINGS AND DISCUSSION

4.1 Introduction

The chapter presents a detailed description of research data, analysis of the data, results, findings and discussion of the study. The research hypotheses and objectives were tested using this data. The main objective of the study was to investigate the effect of competitive advantage and organizational resources on the relationship between, advanced manufacturing technology and organizational performance of large manufacturing companies in Kenya. The independent variable was advanced manufacturing technology, performance of large manufacturing companies in Kenya was the dependent variable, competitive advantage was the mediating variable while organizational resources was the moderating variable.

The target respondents were senior technical and operation managers in manufacturing companies that were members of Kenya Association of Manufacturers (KAM). Companies in the KAM database were considered because it represents and advocates for manufacturing companies in Kenya The target population consisted 55 companies selected from all the manufacturing companies in the KAM. These companies had over 100 employees and applied design technologies, manufacturing technologies and planning technologies in their production processes. Subsequently, 55 self-administering structured questionnaires were given to sampled respondents in these companies to obtain responses for the study. A total of 45 questionnaires were returned by the respondents representing a response rate of 81.8%. Both bivariate and multivariate data analyses were done.

Diagnostic tools that included normality, linearity, and heteroscedasticity tests were used to verify the quality of the data collected on the variables of the study. The research used descriptive statistics to determine the summary of the results for the study. Measures of the variables consisting of, means, standard deviations, and coefficients of variation were computed and are presented in tables and figures. Simple and multiple linear regression analyses were also conducted to test the hypotheses. The focus of the tests was on the relationships the study aimed to investigate and to help in testing the hypotheses. The results obtained were used to make final conclusions regarding the relationships between the study variables with respect to the objectives of the study.

4.2 Data Analysis

Data analysis is used to synthesize information collected in a research study to test the hypotheses developed and provide answers to the research questions. According to Berinato (2019) data analysis should enable the researcher communicate in simple terms to all the audience by answering both academic, business and technical questions. Researchers use data analysis to explain complex results so that both technical and non-technical stakeholders may easily comprehend the solution to the issue under investigation.

The purpose of analyzing data is to obtain useful and relevant information relating to the matter under investigation. Results emanating from data analysis can be presented using full description or summary of the collected data. It is also used to identify existing relationships between study variables, compare study variables under different study conditions set by the researcher, identify observable differences between study variables and provide a forecast or inference on the outcome of the study (Savenye & Robinson, 2005).

According to Shepard (2002), wrong statistical analysis employed by researchers in a study tend to distort scientific findings and mislead other readers and users of subsequent erroneous inferences. This could ultimately have a negative influence on public perception on research from wrong application of data analysis methods. To avoid this occurrence, the researcher has to determine appropriate diagnostic tools to assure the public on the accuracy and integrity of data used in research to validate findings and recommendations. Further, using reliability and validity tests give researchers confidence that results of the study address stated objectives.

It is important for the integrity of data to be maintained during the process of data analysis. The most likely factors that impinge on integrity of data analysis include the environment and context that was used to collect the data (Smeeton &Goda, 2003). Face to face interviews are bound to produce data with different integrity compared to data obtained using survey questionnaires due to the different interaction occurring within a dyadic relationship between these two methods of data collection. Further, researchers at times decide to enhance a significant finding by determining how to present derived data, which portion of the data to present, why, how and to whom (Shamoo, Resnik, 2003). Resulting from this observation, it is recommended that researchers keep the evidence of raw data used in their data analysis for further reference and concurrence to support conflicting results.

4.2.1 Reliability Test

According to Mohajan (2017), for a researcher to declare that an investigation has produced good results, reliability and validity tests should be done on the research instruments before analyzing the data. These are the two most important and fundamental features in the evaluation of the measurement instrument or tool used in the investigation. Validity relates to how well an instrument measure what it is meant to measure in a study while reliability on the other hand is concerned with the faith that one can have in the data obtained by using the study instrument and by extension the degree to which any measuring tool controls for errors.

According to Taber (2018), researchers use Cronbach's alpha statistic (α) to test for reliability. Although a high value of α signifies reliability of the research instrument, Taber (2018) is of the view that a very high value on the other hand is not desired. There is a difference in observed reliability in quantitative research compared to qualitative research. This difference arises from the difficulty in achieving exact results in a repeat study and research process in a qualitative research study. Therefore, reliability in qualitative research also represents the consistency in the study as well (Carcary, 2009; Grossoehme, 2014).

Leung (2015) acknowledges the difficulty to always obtain replicability of results in qualitative research and suggests that results are acceptable when they are within developed margins and findings as long as there is a similarity in the methods used in both studies. This is more pronounced with cross sectional studies as they use data collected at a specific period during the study. To improve reliability of the study, constant data comparison should be used (Silverman, 2009). Researchers are encouraged to determine a comprehensively inclusive scope and analysis methods while maintaining quantitative aspects of data.

Cronbach's (α) has been considered by qualitative researchers to be an appropriate measure of data reliability. Cronbach's (α) is also used to measure the internal consistency reliability when measurements represent multiple questionnaires. Several researchers have proposed different values of Cronbach's (α) for different conditions faced by a researcher. Since there is still no consensus as to what is the best Cronbach's (α) coefficient to assure reliability of the instrument used in the study, different researchers use different cut-off points of Cronbach's (α) coefficient depending on the type of study they are conducting (Taber, 2018).

Bathgate, Crowell, Schunn, Cannady, and Dorph, (2015) reckon that a Cronbach's (α) of 0.77 is acceptable for the instrument used to collect data. Cortina (1993) recommends that for a population of 25 to 50 respondents, a minimum Cronbach's (α) coefficient of 0.5 is suitable for predictive research while Gardner (1995) provides a minimum range for Cronbach's (α) coefficient of between 0.7 and 0.8 for basic and applied qualitative research respectively.

Murphy and Davidshofer (1988) on the other hand reject using a Cronbach's alpha (α) below 0.6. Lin, Liang and Tsai (2015) concur with Davidshofer (1988) and suggest that researchers should aim at a high value of Cronbach's (α) when the research includes a wide range of items that are used in investigating different science concepts. Lin, *et. al.* (2015) recommends Cronbach's alpha of 0.81. The current study adopted a Cronbachs's (α) coefficient between the range of 0.58 to 0.97 to be satisfactory. The results are presented in Table 4.1.

Table 4.1: Cronbach's alpha (α)

Variable	Cronbach's alpha (α)	Number of items in the scale
Advanced Manufacturing Technology	0.9	22
Competitive Advantage	0.8	15
Organizational Resources	0.9	17
Organizational Performance	0.9	14
Acceptable values of α for the study are between 0.58 and 0.97		

Source: Author (2019)

Results of the study show that the least Cronbach's (α) coefficient for the study variables was 0.8. Advanced manufacturing technology had Cronbach's (α) of 0.9, competitive advantage (0.8), organizational resources (0.9) and performance of large manufacturing companies in Kenya (0.9). These results meet the acceptable range of the Cronbach's (α) of 0.58 - 0.97 adopted by the study. Hence, the Cronbach (α) result confirms the reliability of the study instrument and collected data can be used to provide reliable deductions on the study variables as advocated by Murphy and Davidshofer (1988).

4.2.2 Validity Test

It is only when the researcher uses a valid research instrument that the ensuing results and recommendations can be valid. Using appropriate research tools, processes, and data collection methods in qualitative research helps the researcher to affirm the study validity. Therefore, researchers use validity as a process to interrogate if the research question lead to the appropriate outcome, and the choice of methodology elicits appropriate responses to the research question (Leung, 2015). Sürücü and Maslakçı, (2020) are of the view that researchers should test validity of the research instrument to avoid ambiguity and inconclusive findings at the end of the study by taking extra care in building quality in the research process.

According to Ghauri and Gronhaug, (2005) researchers can determine how well they covered the area of their research using validity, Field, (2005) asserts that while the researcher is bound in the area of the study collecting data, it is only validity that explains how well the collected data covers the actual area of investigation. Waterman (2013) noted a challenge in assessing validity in qualitative research. This emanates from different approaches used in adopting research philosophies that ultimately determine research designs adopted for the study. Therefore, the research philosophy leads to a research methodology that enables the researcher to arrive at an appropriate context for the findings to be valid. Finfgeld-Connett, (2010); Palinkas, Horwitz, Green, Wisdom, Duan, and Hoagwood, (2013), posit that for the findings of a study to be valid, sampling procedures and methods should be appropriate, purposeful, and adaptive to the research objective.

Awino and Gituro (2011) regard validity to have three genres that include face or logical validity which uses a superficial and subjective assessment to determine whether the study instrument is measuring the correct dimensions of the variable. It is a subjective judgment on the operationalization of a dimension with an indication of the degree to which a measure appears to be related to a specific dimension. Face validity is used to evaluate the appearance of the questionnaire in terms of feasibility, readability, consistency of style and formatting, and the clarity of the language used. The second genre is content validity, which is the degree to which items in the research instrument reflect the content universe to which the instrument is generalized (Straub & Boudreau, 2004). It is associated with both the sampling adequacy of the test content and responses.

Content validity is also associated with relevance of test content universe and test responses to a behavioral universe, and clarity of content and technical quality of test items. In general, content validity calls for the evaluation of the survey instrument so that it includes all the essential items while eliminating undesirable items relative to the construct dimension (Lewis, 1995; Boudreau, 2001). Specifically, the judgmental approach to establish content validity involves literature reviews followed by a review using experts in the subject matter.

The third genre according to Awino and Gituro (2011) is construct validity which is the demonstration that a test is measuring the construct it claims to be measuring. It refers to how well the concept, idea, or behavior that is a construct is translated into a functioning and operating reality. It has two components that include convergent and discriminant validity. Discriminant validity measures the extent to which one latent variable discriminates from all other latent variables in the study while convergent validity refers to the degree to which two measures of dimensions that theoretically should be related, are in fact related.

Taherdoost (2016) adds criterion validity as the fourth genre of validity. It determines the extent to which a measure is related to an outcome or how well one measure predicts an outcome for another measure. There are two main types of criterion validity namely; concurrent validity and predictive validity. Concurrent validity is related to the accurate prediction and can also refer to when scores from the predictor measure are taken first and then the criterion data is collected later. Predictive validity on the other hand is a type of evidence that can be gathered to defend the use of a test for predicting other outcomes. It refers to the extent to which the results of a particular test, or measurement, correspond to those of a previously established measurement for the same construct.

The measurement scales used in the questionnaire were deemed to have face validity because they reflected key issues in advanced manufacturing technology, competitive advantage, organizational resources and performance of large manufacturing companies in Kenya. Each section of the questionnaire had specific variables determined through consistent expert judgement of the researcher and reviewed literature to confirm if the theoretical dimensions emerge as conceptualized for this study. Hence, the questionnaire as developed was deemed to be a valid instrument to collect data for this study

4.2.3 Diagnostic Tests

Qualitative researchers at times adopt a hermeneutic perspective on collected data. Hermeneutic perspective is considered to represent the view that collected data is an interpretation of the questionnaire by the respondent that can never be judged to be true or false. Therefore, the collected data is deemed to present only one possible interpretation among many alternatives that exist. The meaning and accuracy of the collected data has therefore to be verified using accepted tools to give credibility and acceptance to the overall results of the study. This study used the following diagnostic tools; normality, linearity, multi-collinearity, and heteroscedasticity as preliminary tools to test the quality of the collected data. These tools helped the researcher to validate the results obtained through statistical analytical methods.

4.2.3.1 Normality Test

Normality tests arise from the need to confirm that the variables in the study have a normal distribution before using parametric tests for further analysis of the data. A number of statistical tests used in research to analyze data including correlation, regression, t-tests, and analysis of variance, assume that the data is normally distributed. According to Razali and Wah (2011) normality tests can involve either theory driven methods or descriptive statistics.

Researchers can use different methods to test normality of data. Seier (2002), broadened the scope for testing normality of data by classifying the methods used in carrying out the test into four major categories namely; Skewness and Kurtosis, empirical distribution, regression and correlation and other special tests. Arshad, Rasool and Ahmad (2003) proposed a similar number of categories for testing normality in data as Seier (2002) that include tests based on; moment ratio techniques, chi-square, correlation and empirical distribution function.

Shapiro – Wilk (SW) test is another method that can be employed to test for normality in data. Razali and Wah (2011) reckon that SW is a very powerful method to test for normality in data and confirmed that it can be used in all types of distributions and sample sizes. Royston (1992) improved the Shapiro-Wilk test to enhance its use and allow normality of any size of data in the range of $3 \leq n \leq 5000$ to be tested. Further, Park (2008) also recommends that researchers use the Skewness and Kurtosis coefficient normality tests for descriptive statistics.

According to Mendes and Pala (2003), the SW test was the first test to identify data that was skewed and failed the normality test and also data with Kurtosis. It is now the preferred test used by researchers due to its excellent power properties. To interpret the SW test, the expected values lie between 1 and 0. A value of SW=1 indicates normality while values of W close to 0 indicate lack of normality in the research data. This study used both the Skewness test, Kurtosis test and the SW test to confirm normality of data.

The three normality tests were preferred in determining normality of data in the study due to the strength envisaged in the SW test to accurately confirm normality in small population samples and its ability to compare empirical data with a theoretical distribution while the Skewness and Kurtosis tests are associated with descriptive research (Park, 2008). The three methods were therefore appropriate in this study to determine normality of the data used. A value of skewness test and kurtosis test of zero indicates a perfectly normal distribution.

The target population in the study was 55 organizations which allows using the Skewness and Kurtosis tests. According to Park (2008) in reasonably large samples (more than 200), skewness test does not make a substantive difference in the analysis. Results for normality test on the study variables are presented in Table 4.2.

Table 4.2: Skewness, Kurtosis and Shapiro-Wilk of the Study Variables

Descriptive Statistics

VARIABLES	Skewness		Kurtosis		SW	
	Statistic	Std. Error	Statistic	Std. Error	Statistic	Sig.
Advanced Manufacturing Technology	-0.525	0.357	0.042	0.702	.949	.048
Competitive Advantage	-0.278	0.357	-0.461	0.702	.980	.633
Organizational Resources	-1.134	0.357	2.361	0.702	.929	.010
Organizational Performance of Large Manufacturing Companies in Kenya	-0.424	0.357	-0.318	0.702	.942	.027

Source: Author (2019)

From Table 4.2, the skewness of the study variables was: advanced manufacturing technology (-0.525); competitive advantage (-0.278); organizational resources (-1.134) and organizational performance of large manufacturing companies in Kenya (-0.424). According to Hippel (2010), a skew that falls between -2 and +2 for a sample size of 50 observations represents fairly distributed data. Hence, using skewness test, data collected on all variables in the study was normally distributed. Further, using Karl Pearson's coefficient of skewness, the variable, organizational resources, shows a slightly longer left-hand tail while the other variables, advanced manufacturing technology, competitive advantage and organizational performance are normally distributed.

Further, from the results in Table 4.2, the Kurtosis of the variables which is a measure of the combined weight of the tails relative to the rest of the distribution were: advanced manufacturing technology (0.042), competitive advantage (-0.461), organizational resources (2.361) and organizational performance of large manufacturing companies in Kenya (-0.318). Positive kurtosis for advanced manufacturing technology and organizational resources shows that the weight in the tails of data for these variables is more than what is expected in a normal distribution, while negative kurtosis for competitive advantage and organizational performance of large manufacturing companies in Kenya shows that the weight in the tails is less than the normal distribution.

Results in Table 4.2 also show the results were: Advanced manufacturing technology (0.949), competitive advantage (0.980), organizational resources (0.929) and performance of large manufacturing companies in Kenya (0.942). All the Shapiro – Wilk test values for the study variables were close to 1 confirming normality of the data. Considering that Shapiro – Wilk test, is a very effective descriptive normality test (Razali &Wah, 2011), these results allow the researcher to proceed and perform parametric tests on the data. Normality tests were also done on the study variable dimensions and the results are presented in table 4.3.

Shapiro – Wilk (SW) test results for the normality test of the study variable dimensions show that: (a) The SW of dimensions of advanced manufacturing technology were between, 0.844 and 0.976; (b) competitive advantage, 0.837 and 0.940; (c) organizational resources, 0.837 and 0.910; and (d) performance of large manufacturing companies in Kenya, 0. 904 and 0.939. From these results, data for all the study variable dimensions were normally distributed.

Table 4.3: Test of Normality for each Dimension of the Study Variables

Scale	Skewness		Kurtosis		Shapiro-Wilk	
Study Variable Dimensions	Statistic	Std Error	Statistic	Std. Error	Statistic	Sig.
Advanced manufacturing Technologies						
Design Technologies	-0.024	0.369	-1.109	0.724	0.933	0.018
Manufacturing Technologies	-0.242	0.369	-0.556	0.724	0.976	0.520
Planning Technologies	-1.179	0.369	0.452	0.724	0.844	0.00
Competitive Advantage						
Cost Leadership	-0.619	0.369	-0.383	0.724	0.931	0.016
Differentiation	-0.774	0.369	0.256	0.724	0.94	0.033
Focus	0.393	0.369	-1.204	0.724	0.889	0.001
Organizational Resources						
Assets	-0.937	0.369	0.171	0.724	0.902	0.002
Physical facilities	-0.877	0.369	-0.389	0.724	0.837	0.00
Employee Capabilities	-0.987	0.369	2.71	0.724	0.91	0.003
Organizational Performance						
Customer satisfaction	-0.306	0.369	-0.579	0.724	0.939	0.028
Employee Retention	-0.873	0.369	1.942	0.724	0.904	0.002

Source: Author (2019)

Although the SW test has been observed to be the best normality test, it exhibits limitations with a bias by sample size with larger samples being more likely to give a statistically significant result compared to small sample sizes (Razali & Wah, 2011). This explains the observed low significance values (< 0.005) of the SW test for the study variable dimensions compared to the significant values (> 0.005) for the SW test on the study variables.

4.2.3.2 Multi-collinearity Test

Multi-collinearity is said to exist when the degree of association between the study variables is high. Multi-collinearity reduces the precision of the estimate coefficients, weakening the statistical ability of the regression model. When multi-collinearity exists in regression models, it is not possible to rely fully on the p-values to identify statistically significant variables (Mundfrom, Smith, & Kay, 2018). According to Jamal (2017), multi-collinearity exists either as structural multi-collinearity which occurs when model terms are created using other terms in the model or data multi- collinearity which results from the data itself.

In order to identify this problem, an iteration procedure is done among the study variables to eliminate any pair that show a tendency of association. Mugenda and Mugenda (2012) confirm the possibility of multi-collinearity in regression models where there is a significant correlation among some of the study variables, especially when the regression model has many variables. Researchers can use both the Variance Inflation Factor (VIF) and Tolerance, to identify the presence of multi-collinearity (Woolriddge, 2000). High values of VIF or low values of the tolerance index may indicate that severe effects of multi-collinearity exist. Unfortunately, Green (2000) posits that there is no theoretical way to determine the threshold value for "high" VIF or "low" tolerance index. According to Gitahi and K'Obonyo (2016) the tolerance index provides a measure of how much variance is shared with some other independent variable in the study. Table 4.4 presents multi- collinearity results of the study.

Table 4.4: Multi-Collinearity Values of the Study variables

Variable	Collinearity Statistics	
	Tolerance	**VIF**
Competitive Advantage	0.509	1.963
Organizational Resources	0.600	1.668
Advanced Manufacturing Technology	0.653	1.531
a. Dependent Variable: Organizational Performance in Large manufacturing Companies in Kenya		

Source: Author (2019)

According to Akinwande, Dikko, and Samson, (2015), a value of VIF close to 1 indicates that multicollinearity does not exist among and between the study variables, while values of VIF greater than 5 show high incidents of multi-collinearity and would lead to estimating the coefficients of the variables poorly, consequently generating p-values that are not reliable. In such instances, the remedy would be to: (a) remove the identified variables that are highly correlated from the regression model, (b) combine the correlated variables, or (c) perform an analysis designed for highly correlated variables, such as principal components analysis or partial least squares regression.

Results in table 4.4 show low values of VIF in the study variables. Specifically, the results show VIF for advanced manufacturing technology of 1.531, organizational resources (1.668), and competitive advantage of (1.963). Therefore, using VIF, the results confirm that there was no multicollinearity between and among all the variables in the study. Therefore, the coefficients obtained from the regression model lead to accurate recommendations regarding the relationship between advanced manufacturing technology, competitive advantage, organizational resources and performance of large manufacturing companies in Kenya. Further, this eliminates erroneous findings and recommendations in the study.

According to Gitahi and K'Obonyo (2016), tolerance, which is the reciprocal of variance inflation factor, can also be used to identify the existence of multicollinearity. Tolerance is considered to be the percentage of the variance in a given predictor that cannot be explained by the other predictors in the study (Senaviratna, 2019). Values of tolerance close to 1 indicates that there is little multicollinearity, whereas a value close to zero suggests that multicollinearity may be present among the study variables. Similar to VIF, there is no consensus on the value of tolerance that would provide a cutoff on minimum or maximum values, for determining presence or lack of multicollinearity (Midi, Sarkar, & Rana, 2013).

According to Mayers (1990) and Menard (2002), a tolerance value below 0.1 or 0.2 would indicate existence of multicollinearity respectively. The results in table 4.4 show tolerance results for advanced manufacturing technology to be 0.653, organizational resources (0.600) and competitive advantage (0.509). According to Hosmer, Lemeshow, and Sturdivant, (2013), these values show that there was no multicollinearity among the variables in the study

4.2.3.3 Linearity Test

The linear relationship of the variables was further explored using scatter diagram. The Q-Q plot was used in the scatter plot. The Q-Q plot, is a graphical tool used to help researchers determine if a set of data that is being analyzed came from normal or exponential distributions. Q-Q plots are subjective but allows the researcher to see at-a-glance if the assumptions inthe study are realistic. If the assumptions are found not to be realistic, the Q-Q plots allows the researcher to determine the sets of data responsible for the violation of the assumptions. Figure 4.1 presents the Q-Q plot for advanced manufacturing technology.

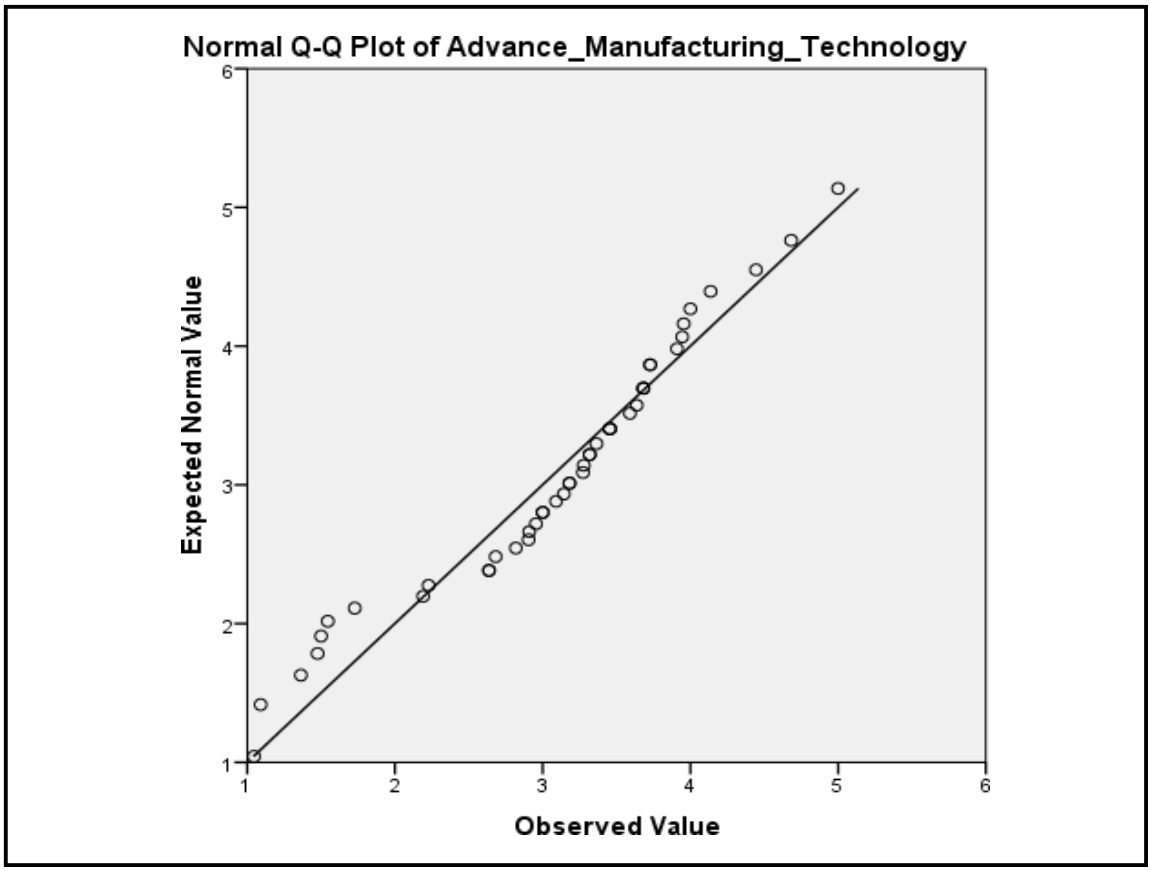

Figure 4.1: Scatter Plot Diagram of Advanced Manufacturing Technology
Source: Author (2019)

Figure 4.2 presents the Q-Q plots for competitive advantage. The plots appear to fall on a straight line indicating normal distribution of the data for the study variable, competitive advantage a common procedure is to test out several different distributions with the Q- Q plot to see if one fits the data well.

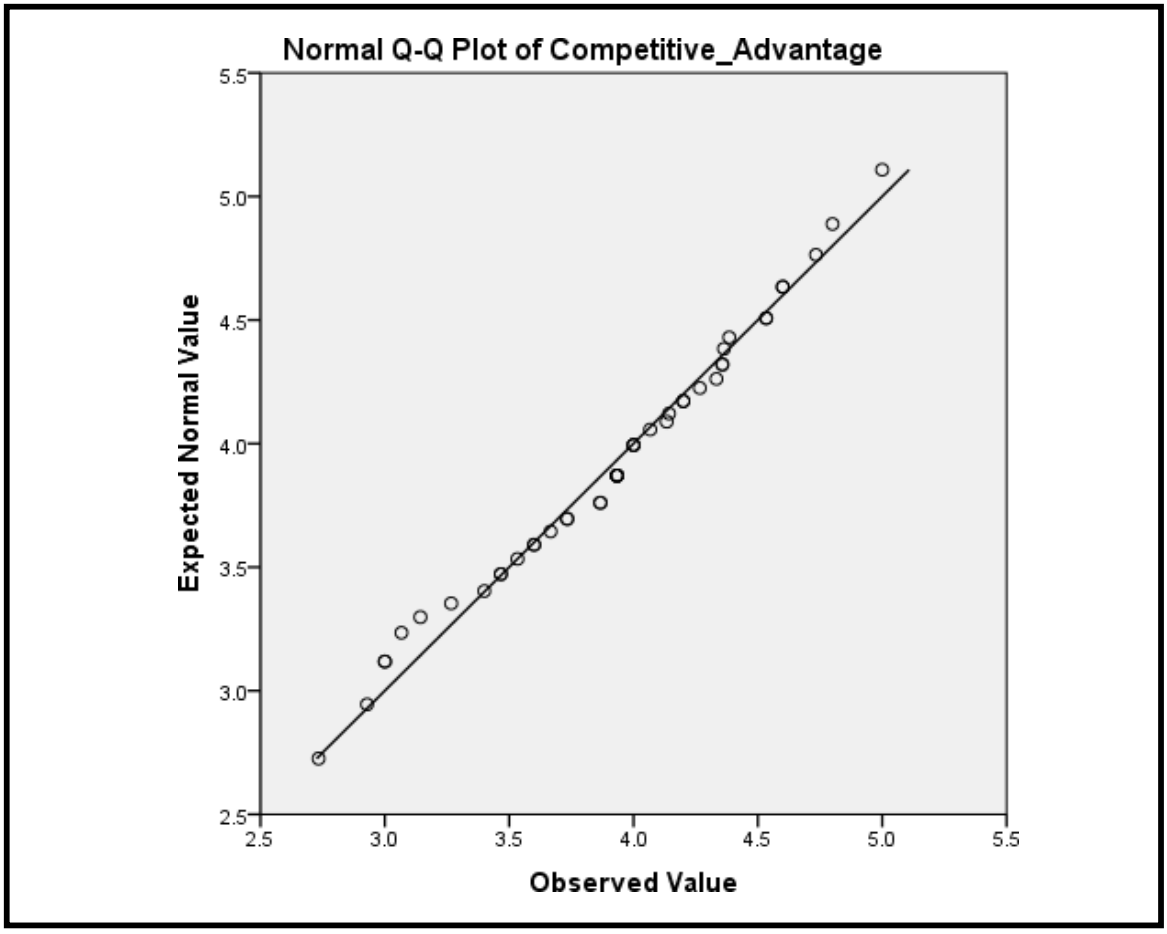

Figure 4.2: Scatter Plot Diagram of Competitive Advantage
Source: Author (2019)

The points are mostly clustered on the 45-degree line, suggesting the competitive advantage sample data is normally distributed. If the data does not fall on the 45-degree line and follows a curve, it shows that the data is not normally distributed and is skewed. The assumption of normality is an important assumption for many statistical tests, as the researcher assumes that the sampling was done from a normally distributed population.

Figure 4.3 presents results for the Q-Q plots of organizational performance study variable. The results indicate a possible minor skew of the data to the right as most of the data appear to fall on the straight line. This may be caused by outliers in the sampled data which if ignored does not affect the normality of the data and allows for parametric tests to be done.

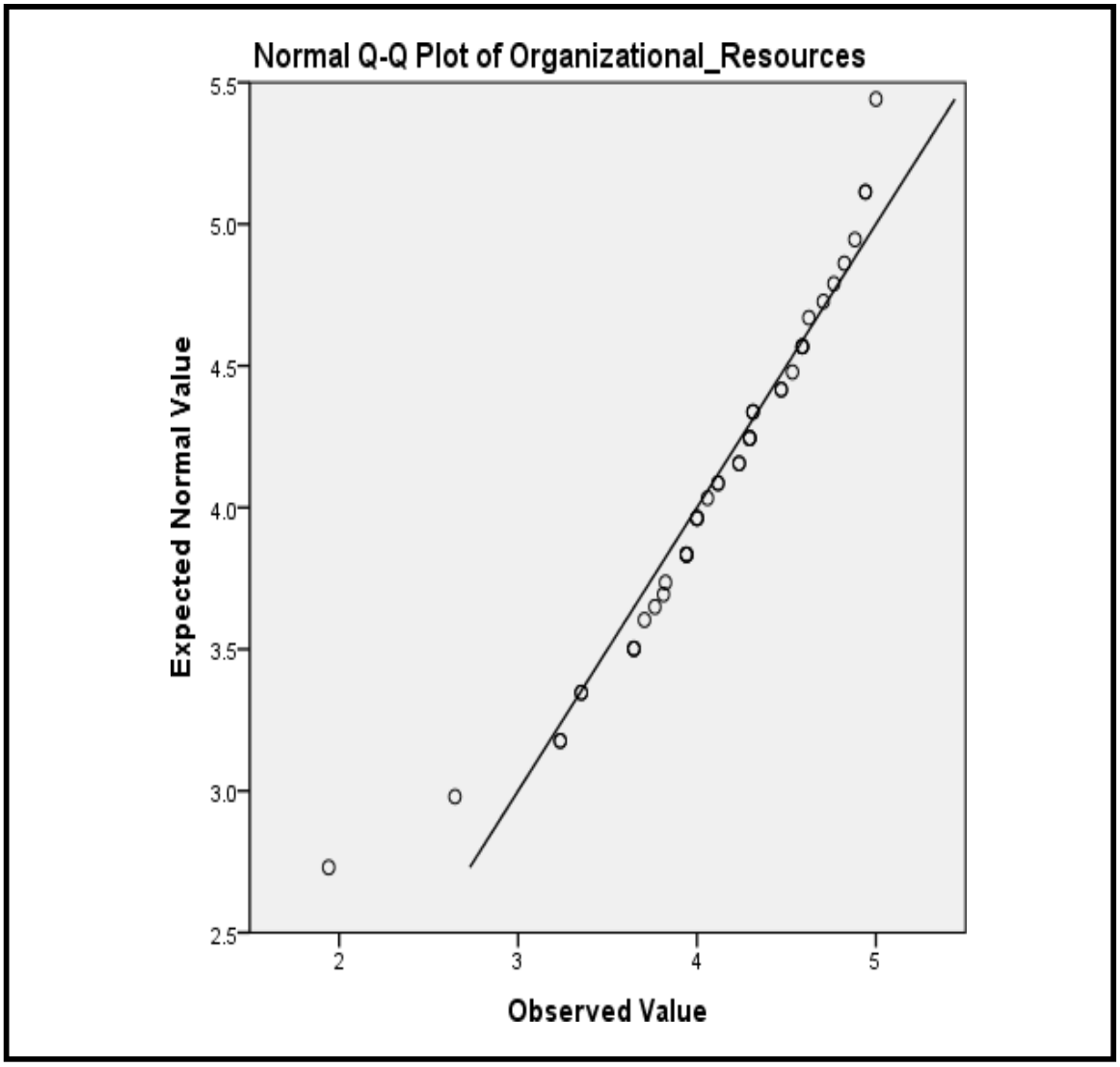

Figure 4.3: Scatter Plot Diagram Organizational Resources
Source: Author (2019)

Figure 4.4 presents the results for the Q-Q scatter plot for performance of large manufacturing companies in Kenya variable. Rhiel and Chaffin (1996) reckon that if the skewness of the parent population is in the opposite direction of the rejection region, then the observed skewness in the direction of the rejection region tail as well as the significance is high. The significance is lower than the nominal when the skewness is observed to be in the same direction as the one for the rejection region tail. The results in figure 4.4 show the plots were relatively linear as they are generally clustered around the 45- degree line.

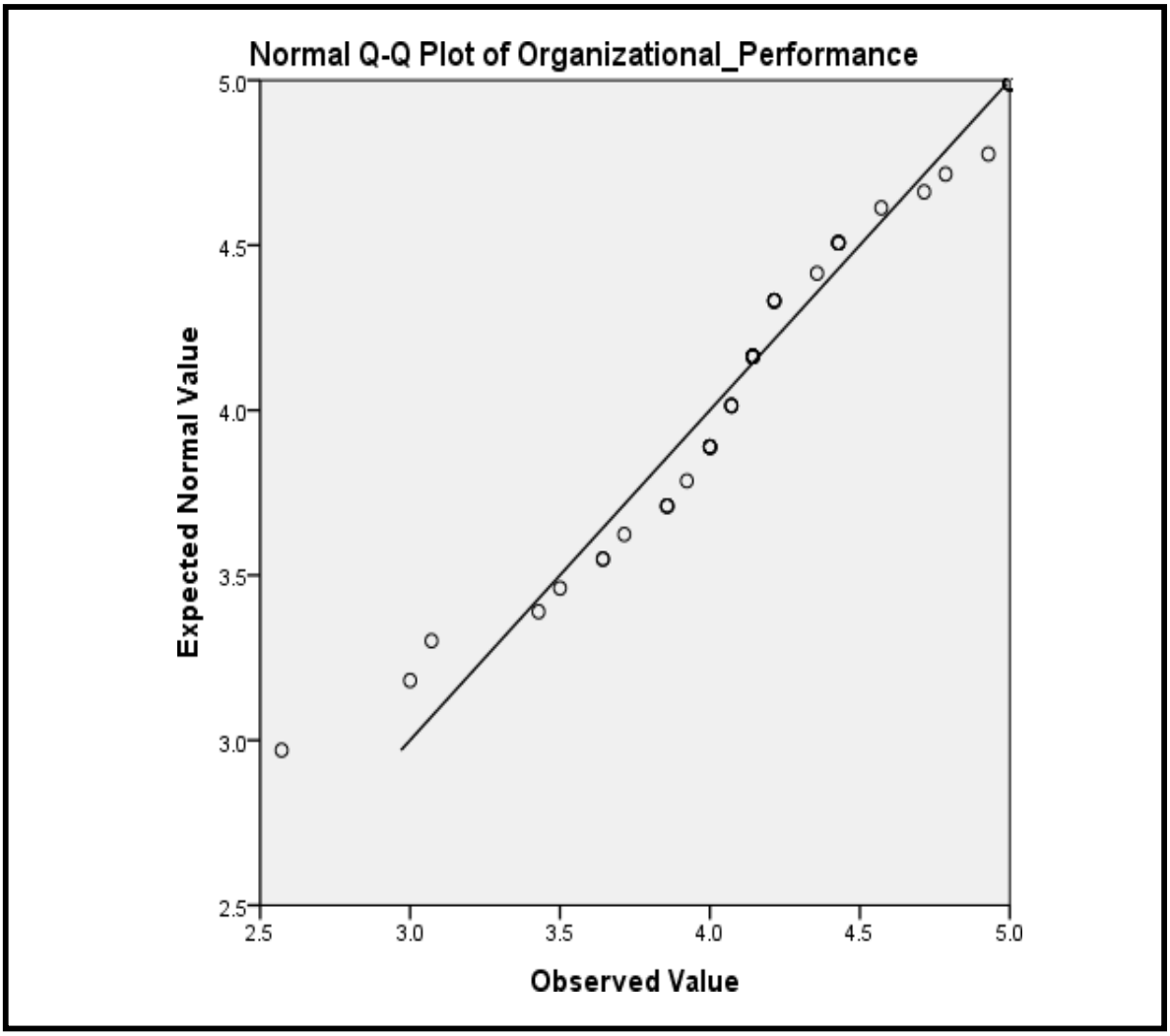

Figure 4.4: Scatter Plot Diagram Performance of Large Manufacturing Companies in Kenya

Source: Author (2019)

The results from the Q-Q scatter plots show that the data was linear as reflected in Figure 4.1, Figure 4.2, Figure 4.3 and Figure 4.4 with all the data points falling close to or on the best fit line. Therefore, the data collected for the research was normally distributed and parametric statistics tests can be carried out. In Q-Q plot the focus is normally on the central part of the linearity rather than the extreme plots. This is because the normal curve is asymptotic to the X-axis and so reflects in the extreme points of the straight-line plots. Q-Q plots are preferred due to their ability to perform well even for small sample sizes. Since most of the statistical methods depend on the normality assumptions, checking normality for the sample data is important as the inference derived from the analysis may not be precise.

4.2.3.4 Heteroscedasticity Tests

A priori probability of having an erratic value of homoscedasticity being relatively high leads to heteroscedasticity. Homoscedasticityrefers to the assumption that the dispersion observed in variables used in a study are the same according to the Gauss-Markov conditions. Researchers often assume that homoscedasticity exists in regression analysis, though in some contexts it may be more reasonable to suppose that the potential dispersion in observations in the sample are different (Olofin, Kouassi, & Salisu, 2009).

According to Olofin, Kouassi, and Salisu, (2009) Heteroscedasticity is likely to be aproblem when the values of the variables in the regression equation vary substantially in different observations. This study used the Glejser test which allows the researcher to explore the nature of heteroscedasticity more closely (Baltagi, 2008). This test rejects the null hypothesis of homoscedasticity if the estimate of β is significantly different from 0 (If the Sig. value in the test is > 0.05 it indicates no heteroscedasticity but if the Sig. value is < 0.05, then heteroscedasticity is confirmed)

Table 4.5: Heteroscedasticity Coefficients

Variable	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	0.466	0.264		1.768	0.085
Advanced Manufacturing Technology	0.021	0.044	0.092	0.474	0.638
Competitive Advantage	-0.031	0.086	-0.078	-0.356	0.724
Organizational Resources	-0.026	0.07	-0.077	-0.377	0.708
a. Dependent Variable:					

Source: Author (2019)

The results for heteroscedasticity are presented in table 4.5. From the results, the significant value for advanced manufacturing technology was 0.638, competitive advantage (0.724), and organizational resources (0.708). All these values are > 0.05 indicating no presence of heteroscedasticity in the study variables.

4.3 Descriptive Statistics

Descriptive Statistics involves presentation of numerical facts, or data, in either tables or graphical form, together with the methodology for analyzing the data. They seek to describe the main features of both quantitative and qualitative data quantitatively. Descriptive statistics are used to summarize the inherent characteristics of a sample while inferential statistics uses the results from the sample to learn and have more information and knowledge about the population it represents (Hofer & Schendel, 1978). Therefore, descriptive statistics differs from inferential statistics as they are not developed on the basis of probability theory.

Statistical inference in research describes the probabilistic process used to interpret data from a sample and relate the findings to the population represented by the sample. More specifically, when researchers encounter data that is prone to random variation caused by observational errors, random sampling and random experimentation, they use statistical inference to draw conclusions relating to these data sets. (Das & Sahu, 2015). Inferential statistics requires that the conclusions derived from the results should be logical and reasonable when they are applied to known practical situations and should be able to be objectively applied to other similar or related situations.

4.3.1 Background Information

Background information in the research study is useful to identify the salient features and information about the respondent or the subject of interest in the research. Background information also helps researchers to broadly determine and categorize samples or population in the study using appropriate methods to filter the population and select the target population. The information is included either at the beginning of the questionnaire or at the end depending on the design of the questionnaire.

The design of a questionnaire is determined by the type of investigation being conducted. The information to be collected using the questionnaire is either qualitative for a qualitative study or quantitative for a quantitative study. While a qualitative questionnaire leads to better understanding or generation of hypotheses on study subjects, quantitative information is used to test specific hypotheses that have previously been generated. Background information in this study was included at the beginning of the questionnaire.

4.3.1.1 Position / Title of the Respondent

The title or position of respondents in organizations providing data to be analyzed in a study helps researchers to determine suitability of the respondent in providing required information. Results presented in Table 4.6 show that out of the respondents in the study, 28.6% held the position of Engineering manager, 25.7% were Director Technical Services, 25.7% were Director of Manufacturing, while 20.7% held the position of Factory Manager. These results indicate that respondents were in the top tier management positions in their organizations.

This cadre of employees is responsible for controlling and overseeing the entire organization. Further, they are key players in developing goals, strategic plans, company policies, and making decisions on the direction of organizations. In addition, top-level managers play a significant role in the mobilization of outside resources, manage manufacturing operations, and are privy to the required information regarding variables in the study.

Table 4.6: Respondents Job Position/Title

Job Position/Title	Frequency	Percentage (%)
Engineering Manager	10	28.6
Director Technical Services	9	25.7
Director Manufacturing	9	25.7
Factory Manager	7	20.0
Total	35	100
Missing (System)	10	
Total	**45**	**100**

Source: Author (2019)

Information provided by this group of employees is deemed to be a true reflection of the issues and performance within the organization (Hambrick & Mason, 1984). The data provided by the respondents in the study was presumed to be relevant, accurate and appropriate for use in data analysis to help the researcher arrive at conclusions, inferences and recommendations related to the study variables.

4.3.1.2 Number of Years Worked with the Organization

The period that a respondent has been exposed and interacted with the variables of the study is important and has a relationship with the findings in a research study. Employees tend to keep informal information about the organization and its operations. Therefore, the longer a respondent has worked in an organization, the more information about the organization he holds, and is suitable as a respond to provide accurate information regarding study variables, if they do not have a bias. This gives the researcher the comfort that the provided information is accurate and would enrich the findings of the study. Table 4.7 presents results on the period respondents had worked in the current organization. The study did not consider other periods the respondent had worked in other different organizations.

Table 4.7: Number of Years Worked with the Current Organization

Number of years respondent has worked with the current organization	Frequency	Percentage (%)
Less than 1 Year	4	8.9
Between 1- 3 Years	14	31.1
Between 4 – 9 Years	16	35.6
Between 10 -15 Years	9	20.0
Over 20 Years	2	4.4
Total	**45**	**100**

Source: Author (2019)

The results show that out of the responses received on the study instrument: 8.9% had worked for less than 1 year in their current organizations; 31.1 % had worked for between 1 to 3 years; 35.6% had worked for between 4 to 9 years; 20% had worked for between 10 to 15 years; and 4.4% had worked for more than 20 years. Cumulatively, 60% of the respondents had been in employment with current organizations for more than four (4) years while 8.9% of the respondents had been in employment with current organizations for less than one (1) year. According to Patel *et al*., (1996), the period organizations keep employees provides a measure of employee retention, and competency. Employee retention leads to preservation of organizational knowledge that is important during change management to improve performance in the current era of a dynamic corporate workforce (Coffey & Hoffman, 2003).

4.3.1.3 Market Coverage

Organizations achieve market coverage by using different strategies that include; concentrated marketing, differentiated marketing, or undifferentiated marketing. Farris *et. al.,* (2010) reckon that market coverage can be determined by market share controlled by the organization, representing the volume of goods or service level within a particular geographic area, compared to the volume of similar goods by competition. Vargo and Lusch (2004) define market share to be the way that an organization predicts market dynamics and implements either proactive or reactive strategies to meet the consumer needs in the market.

Knowledge of market coverage provides organizations with an opportunity to introduce new products and also enhances their ability to increase or maintain their market share. Market coverage in this study was determined by geographic area where the organization owned active retail and/or wholesale outlets that sold their products. Results on market coverage are presented in table 4.8.

Table 4.8: Market Coverage

Market Coverage (Area)	Frequency	Percentage (%)
National	7	15.6
Regional (within East Africa)	24	53.3
Continental (Within Africa)	1	2.2
Global (Africa and Beyond)	13	28.9
Total	**45**	**100**

Source: Author (2019)

Results for market coverage in Table 4.8 show that 15.6% of the organizations retail or wholesale outlets were National, 53.3% were Regional (Within East Africa), 2.2% were Continental (Within Africa), while 28.9% were Global (international market - Africa and beyond). The results also show that 68.9% of the organizations had their market coverage in Kenya and the East African region, implying that more than 50% of their products are used in the East African market. Further, 28.9% had a global market coverage that required them to implement manufacturing strategies to make them compete effectively in the global market.

4.3.1.4 Number of Years in Operation

The resilience of an organization to market dynamics is correlated to the time it has been in operation. In Kenya, 46% of MSME's close down after 1 year while 15% of the remaining MSME's close down one year later (KNBS, 2019). According to Zontanos & Anderson (2004), over two thirds of small businesses close down between one (1) and ten (10) years after they begin operations. Further, in Canada 30% of small businesses shut down within one year and up to 75% after 9 years (Industry Canada, 2010), while in the United States (Small Business Administration, 2010) 33% of start-ups close by the end of the second year and 50% fail after 4 years. Table 4.9 presents results on the number of years the organizations had been in operation since incorporation.

Table 4.9: Number of Years in Operation

Number of years the Organization has been in Operation	Frequency	Percentage (%)
Less than 1 year	1	2.2
Between 1 – 3 Years	2	4.4
Between 4 – 6 Years	7	15.6
Between 7 – 10 Years	9	20.0
Over 10 Years	26	57.8
Total	**45**	**100**

Source: Author (2019)

The results in Table 4.9 show that 2.2% of the organizations had been in operation for less than 1 year, 4.4% for between 1 and 3 years, 15.6% between 4-6 years, 20% between 7-10 years, and 57.8% for over 10years. The results also show that 93.4% of the organizations had been in operation for more than 4 years. This period (4 years) is considered by the study to be adequate for the organizations to have generated reliable and valid data from their operations to enable plausible conclusions, inferences and recommendations to be made on the relationships that exist between and among the study variables. It can also be inferred from the results that since 77.8% of the organizations had been in operation for 7 years and above, they could be in their second cycle of a 5-year manufacturing strategy implementation.

4.3.1.5 Number of Permanent Employees in the Organization

The size of organizations is determined using either the number of employees, the total annual revenues, or the capital investment employed (ILO, 2020). Dogan and Bera (2019) found that part time employees and casual employees have a low job satisfaction in an organization, leading to low employee productivity, while, Odero and Makori (2018) found that permanent employee involvement in decision making in organizations accounts favorably for performance within the organization. Permanent employees were considered to indicate the real size of the company in line with other similar studies (Awino, 2011).

Table 4.10: Number of Permanent Employees in the Organization

Number of permanent employees in the organization	Frequency	Percentage (%)
Less than 50	1	2.2
Between 50-100	9	20.0
Between 101-200	9	20.0
Over 200	26	57.8
Total	**45**	**100**

Source: Author (2019)

The results presented in Table 4.10 show that only 2.2% of the organizations in the study had less than 50 permanent employees. Most of the organizations (57.8%) had over 200 permanent employees, 20.0% had between 50 and 100 permanent employees and another 20.0% also had between 101 and 200 permanent employees. The results also show that a total of 97.8% of the organizations had more than 50 permanent employees.

Further, the results show that 77.8% of the organizations in the study had more than 100 permanent employees and were regarded as large manufacturing companies when the number of employees is used in determining the size of the organization. This proportion was considered to be adequate for the analysis of investigating the study variables to proceed with the dependent variable being performance of large manufacturing companies in Kenya.

4.3.1.6 Manufacturing Strategy Implementation

There are various manufacturing strategies that manufacturing organizations implement in their operations to meet the challenges of the operating environment and also fulfil their customer needs. Cousens et al. (2009) suggested a framework that enables manufacturing organizations to establish competitive capability in flexible manufacturing by implementing strategic plans to address challenges in their manufacturing processes. Wei, Song, and Wang, (2017) have shown the influence of manufacturing flexibility on business models and firm performances, considering their contextual fit with the market environment.

Table 4.11: Manufacturing Strategy Implementation

Organizations with Manufacturing Strategy	Frequency	Percentage (%)
Yes	38	84.44
No	4	8.89
System (Missing)	3	6.67
Total	**45**	**100**

Source: Author (2019)

The results in Table 4.11 revealed that 84.44% of the companies in the study had implemented a formal manufacturing strategy within the last six years, while 8.89% of the companies had not implemented a formal manufacturing strategy within this time frame. Daniel (2014) reiterates the influences of strategic planning, whether formal or informal, and strategic organization on performance. Strategy exploits the opportunities within the environment consequently having a positive relationship to performance.

The results in Table 4.11 and the results in Table 4.9 show a slight difference between organizations that had implemented a manufacturing strategy in the last 6 years (84.44%) and those that had been in operation for more than 6 years (89.4%). This implies that approximately 5.04% of the companies that that have been in operation for more than 6 years did not have a strategic plan.

4.3.2 Advanced Manufacturing Strategy

The study investigated the relationship between advanced manufacturing technology and organizational performance of large manufacturing companies in Kenya. Respondents were required to indicate the extent to which advanced manufacturing technology was applied in the operations of the organizations. A Likert scale of 1-5 was used where 1= Not at all, 2= Small extent, 3= Moderate extent, 4= Great extent, and 5= Very great extent. Advanced manufacturing dimensions in the study included; design technologies, manufacturing technologies and planning technologies. Results for the application of advanced manufacturing technology in the operations of large manufacturing companies in Kenya are presented in the following sections.

4.3.2.1 Design Technologies in the Organization

Managers apply technology in manufacturing operations in their organizations to benefit from the value they expect to gain which includes developing competitive advantage in their operating industries (Mohanty, Gahan, & Choudhury, 2014). The indicators that were used for design technology in the study included; Computer aided design (CAD), Computer aided Engineering (CAE), Computer aided process planning (CAPP) and Group technology (GT). Results on application of design technologies are presented in Table 4.12.

Table 4.12: Design Technologies in the Organization

Design technology Indicator	Min	Max	Mean	Std. Deviation	Coefficient of Variation
Computer Aided Design	1	5	3.2	1.4	0.45
Computer Aided Engineering	1	5	2.8	1.4	0.49
Computer Aided Process Planning	1	5	2.8	1.3	0.49
Group Technology	1	5	2.4	1.5	0.62
Average	**1**	**5**	**2.8**	**1.4**	**0.51**

Source: Author (2019)

The results of the study on the application of design technologies in the organizations revealed that: CAD having a mean of 3.2, CAE (mean 2.8), and CAPP (mean 2.8) were used to a moderate extent while GT (mean 2.4) was used to a small extent. The standard deviation which is a measure of the spread of the values on the use of design technologies were: CAD (1.4), CAE (1.4), CAPP (1.3) and GT (1.5). Further, the coefficient of variation on the use of design technologies were: CAD (0.45), CAE (0.49), CAPP (0.49) and GT (0.62).

Arising from the results in Table 4.14 application of CAD in the operations of large manufacturing companies in Kenya was more than the other design technologies, while GT was the least. The use of CAE and CAPP was the same but lower than CAD and higher than GT. Organizations use CAD to gain competitive advantage especially when they are involved in innovation and new product development. Further, CAD also allows organizations to reduce their operation costs by reducing the time it takes to deliver the product to the market.

4.3.2.2 Manufacturing Technologies in the Organization

The study used ten indicators to determine the application and effect of manufacturing technologies dimension of advanced manufacturing technology in large manufacturing companies in Kenya. The indicators included: Computer aided manufacturing (CAM), Computer integrated manufacturing (CIM), Computer numerically controlled machines (CNC), Numerically controlled machines (NC), Flexible manufacturing systems (FMS), Computer aided inspection (CAI), Industrial robots (IR), Automated guided vehicles (AGV), Automated storage and retrieval systems (AS/RS) and Program logic controllers (PLC).

Organizations incorporate Industry 4.0 in their manufacturing processes as they are able to successfully manage the interface of advanced manufacturing technology and Industry 4.0 (Bag, Gupta & Kumar, 2020). This strategy promises organizations to manage the increasing complexity of customers and provide greater flexibility for production systems (Bildstein & Seidelmann, 2014; Schröder, 2016). Improved equipment maintenance regimes by using advanced manufacturing technology on the other hand allow organizations to reduce operation costs and equipment failures enabling them to realise optimum capacity through operating reliable and efficient production equipment (Ergüden, Kaya, Tanyer, 2018). Organizations achieve this through keeping low inventories of equipment spare parts among other initiatives. Results on application of manufacturing technologies is presented in table 4.13.

Table 4.13: Manufacturing Technologies

Manufacturing Technology Indicator	Min	Max	Mean	Std. Deviation	Coefficient of Variation
Computer Aided Manufacturing	1	5	3.3	1.3	0.39
Computer Integrated Manufacturing	1	5	3.0	1.3	0.42
Computer Numerically Controlled Machines	1	5	3.1	1.6	0.5
Numerically Controlled Machines	1	5	3.2	1.6	0.49
Flexible Manufacturing Systems	1	5	3.0	1.3	0.44
Computer Aided Inspection	1	5	2.3	1.3	0.55
Industrial Robots	1	5	1.5	1	0.72
Automated Guided Vehicles	1	5	1.7	1.2	0.72
Automated Storage and Retrieval Systems	1	5	2.3	1.5	0.66
Program Logic Controllers	1	5	3.2	1.6	0.50
Average	**1**	**5**	**2.7**	**1.4**	**0.54**

Source; Author (2019)

The results from the study on the application of manufacturing technologies revealed that: CAM (mean 3.3), CIM (3.0), CNC (3.1), NC (3.2), FMS (3.0), and PLC (3.2) were used to a moderate extent; while CAI (2.3), IR (1.5), AGV (1.7), and AS/ RS (2.3) were used to a small extent. Organizations applied CAM the most while IR was the least applied in their operations.

The standard deviation on the application of manufacturing technologies were: CAM (1.3), CIM (1.3), CNC (1.6), NC (1.6), FMS (1.3), CAI (1.3), PLC (1.6), IR (1.0), AGV (1.2), and AS/RS (1.5) while the coefficient of variation on the use of manufacturing technologies were: CAM (0.39), CIM (0.42), CNC (0.5), NC (0.49), FMS (0.43), CAI (0.55) PLC (0.5), Industrial robots (0.71); AGV (0.72); and AS/RS (0.66).

Further, the results in Table 4.13 show that CAM, PLC and, NC were the top three applied manufacturing technology indicators by large manufacturing companies in Kenya in their production processes. These three technologies incidentally are related as CAM in most cases is associated with the use of NC and PLC. The results also show application of IR, CAI, AGV and AS/RS technologies were the least out of all the manufacturing technology indicators considered in the study. None of the manufacturing technologies are used to a great extent by large manufacturing companies in Kenya.

4.3.2.3 Planning Technologies in the Organization

The study used eight indicators to determine the application and effect of planning technologies dimension of advanced manufacturing technology in large manufacturing companies in Kenya. The planning technology indicators used in the study included; Materials requirement planning (MRP), Manufacturing resource planning (MRPII), Computer preventive maintenance planning (CPM), Just in time (JIT), Management information systems (MIS), Enterprise resource planning (ERP), Total quality management (TQM) and, Customer relationship management (CRM).

Findings of the study presented in Table 4.14 show that; MRP, ERP, MIS, TQM, and CRM planning technology indicators were used to a great extent; while, MRP II, CPM, JIT were used to a moderate extent. Further, the results show that large manufacturing companies in Kenya apply ERP more than any of the other planning technology indicators used in the study. Organizations use ERP to generate real time information on the production process and also develop data that they analyze to have up to date information and understand the manufacturing process.

Results also show that CRM was used by the organizations to a great extent. Organizations use CRM which is a process with a series of activities to manage current customers, nurture new prospects, and pursue sales opportunities. The main purpose of applying CRM in the business process is to collect and integrate customer feedback in the product/service offered to consumers to improve both business to business (B2B) and business to consumer (B2C) performance. Organizations also use CRM to actively listen, pay attention to detail, and develop product consistency which leads to strengthening customer relationships over time.

Table 4.14: Planning Technologies

Planning Technology Indicator	Minimum	Maximum	Mean	Std. Deviation	Coefficient of Variation
MRP	1	5	3.7	1.4	0.38
MRPII	1	5	3.2	1.4	0.43
CPM	1	5	3.2	1.3	0.42
JIT	1	5	2.9	1.3	0.47
MIS	1	5	3.7	1.4	0.36
ERP	1	5	4.2	1.3	0.30
TQM	1	5	3.7	1.2	0.32
CRM	1	5	3.9	1.3	0.33
Average	**1**	**5**	**3.55**	**1.32**	**0.38**

Source: Author (2019)

Results in Table 4.14 show the standard deviation (σ) on the application of planning technologies were: MRP (1.4), MRP II (1.4), MIS (1.4), CPM (1.3), JIT (1.3), CRM (1.3), ERP (1.3), and TQM (1.2). Although MRP and MRP II were used at different rates, their standard deviation was the same. The standard deviation for TQM was the lowest at $\sigma = 1.2$. The coefficient of variation for the application of the planning technology indicators were: MRP (0.38), MRP II (0.43), MIS (0.42), CPM (0.47), JIT (0.36), CRM (0.30), ERP (0.32), and TQM (0.33). Managers in manufacturing organizations expect to use planning technologies to grow their revenues.

The results show that ERP is used more than any other planning technology and the extent of variability about its mean is also the lowest at CV=0.30, while JIT is the least used planning technology but with the highest variability about the mean at CV = 0.47. Organizations choose to apply ERP in their production systems due to the flexibility that makes it possible to be integrated with various operations. Its use is further enhanced by its ability to be used either as a stand-alone technology that is easy to use in simple organizations or integrated within the operations of a complex production system. On the other hand, JIT, though popular in developed economies, is a challenge in developing economies due to poor infrastructure which is one of the factors that determine its effectiveness in achieving delivery standards.

4.3.2.4 Joint Descriptive Statistics for Advanced Manufacturing Technology

The findings in Table 4.15 revealed that large manufacturing companies in Kenya apply the use of advanced manufacturing technologies in their production processes. The overall use of advanced manufacturing technology by large manufacturing companies in Kenya was to a moderate extent (mean, 3.00). The application of planning technologies in the production process was to a great extent (mean, 3.55) while the application of both manufacturing technologies (mean, 2.70) and design technologies (mean, 2.80) was to a moderate extent. Therefore, large manufacturing companies in Kenya use advanced manufacturing technology to a moderate extent and in particular apply planning technologies in their production process more than design technologies and manufacturing technology dimensions of advanced manufacturing technology.

Further, managers in manufacturing companies embrace advanced manufacturing technology in their production process at varying levels. Despite organizations applying both design and manufacturing technologies to a moderate extent, the results in Table 4.15 show that design technology is used slightly more than the manufacturing dimension. ERP (mean, 4.20) is the most widely used technology from the advanced manufacturing technologies considered in the study, while IR (mean, 1.5) is the least used technology among the technologies in the planning dimension. Five of the most widely used technologies ERP, MRP, MIS, TQM, and CRM are planning technologies while the least used technologies IR, AGV and AS/RS are manufacturing technologies.

Table 4.15: Application of Technology in the Manufacturing Process

Design Technologies					
	Min	**Max**	**Mean**	**Std. Deviation**	**Coefficient of Variation**
CAD	1	5	3.2	1.4	0.45
CAE	1	5	2.8	1.4	0.49
CAPP	1	5	2.8	1.3	0.48
GT	1	5	2.4	1.5	0.62
Average	**1**	**5**	**2.8**	**1.4**	**0.51**
Manufacturing Technologies					
CAM	1	5	3.30	1.30	0.39
CIM	1	5	3.00	1.30	0.42
CNC	1	5	3.10	1.60	0.50
NC	1	5	3.20	1.60	0.49
FMS	1	5	3.00	1.30	0.44
CAI	1	5	2.30	1.30	0.55
Industrial Robots	1	5	1.50	1.00	0.72
AGV	1	5	1.70	1.20	0.72
AS/RS	1	5	2.30	1.50	0.66
PLC	1	5	3.20	1.60	0.50
Average	**1**	**5**	**2.66**	**1.36**	**0.54**
Planning Technologies					
MRP	1	5	3.70	1.40	0.38
MRPII	1	5	3.20	1.40	0.43
CPM	1	5	3.20	1.30	0.42
JIT	1	5	2.90	1.30	0.47
MIS	1	5	3.70	1.40	0.36
ERP	1	5	4.20	1.30	0.3
TQM	1	5	3.70	1.20	0.32
CRM	1	5	3.90	1.30	0.33
Average	**1**	**5**	**3.55**	**1.32**	**0.38**
TOTAL AVERAGE	**1**	**5**	**3.00**	**1.36**	**0.45**

Source: Author (2019)

The results in table 4.15 show that large manufacturing companies in Kenya are likely to use planning technologies compared to manufacturing and design technologies in their production process. Planning technologies enable organizations in decision making regarding when and how they manufacture their products and services to optimize on the use of resources they own, while meeting the needs of their consumers. Further, the results from this study show that large manufacturing companies in Kenya employ advanced manufacturing technologies at different levels in their production process from a great extent to a moderate extent.

4.3.3 Competitive Advantage

The second objective of the study was to investigate the relationship between advanced manufacturing technology, competitive advantage and organizational performance of large manufacturing companies in Kenya. Data was collected through a Likert scale to determine the effect of cost leadership, differentiation and focus attributes of competitive advantage on the relationship between advanced manufacturing technology and performance of large manufacturing companies in Kenya. Respondents were required to indicate using a Likert scale ranging between 1-5, where, 1= Strongly disagree: 2=Moderately disagree: 3=Neutral: 4= Moderately agree: 5= Strongly agree, on the attributes of competitive advantage and performance.

4.3.3.1 Cost Leadership Strategies

The study used seven aspects associated with cost leadership strategies. The aspects included; Employees possessing high Process engineering skills, products designed with ease of manufacturing concepts, easy and sustained access to inexpensive capital, Management supervision of labour, Management of production costs, Incentives for employees based on performance and controlling overall operation costs in the organization.

Results presented in table 4.16 show that out of the seven aspects of cost leadership strategies: respondents strongly agree that the organizations' management always had tight control on production costs. In manufacturing organizations, production costs consist of all the costs that are incurred to purchase all the production inputs and the attendant costs of transforming them into finished products for use by consumers.

Table 4.16: Cost Leadership

Cost Leadership Indicator	Min	Max	Mean	Std. Deviation	Coefficient of Variation
High Process engineering skills among employees	1	5	4.0	0.8	0.20
Our products are designed for ease of manufacture	1	5	4.2	0.9	0.22
The organization has sustained access to inexpensive capital	1	5	3.5	1.2	0.34
Management exercises close supervision of labour	1	5	4.3	0.8	0.18
Management always has tight production cost control	1	5	4.5	0.8	0.17
Employees are given incentives based on quantitative targets.	1	5	3.6	1.2	0.32
Management always ensure that all costs in the organization are kept at the minimum possible level.	1	5	4.4	0.8	0.19
Average	1	5	**4.1**	**0.9**	**0.23**

Source: Author (2019)

Respondents moderately agreed that their organizations had high process engineering skills among employees, products in their companies were designed for ease of production, management exercised close supervision of labour, management always ensured that all costs were maintained at minimum levels, employees were given incentives based on quantitative targets and their organizations had sustained access to inexpensive capital. These findings indicate that organizations are aware of the make-up of their costs, which they manage in order to achieve low unit production costs in their endeavour to improve their performance.

Further, the results show that respondents consider managing production costs (mean, 4.5) to be the best benefit organizations achieve by using advanced manufacturing technology followed by; management always ensuring that all costs in the organization are kept at the minimum possible level (4.4), Management exercises close supervision of labour (4.3), their products having been designed for ease of manufacture (4.2), High Process engineering skills among employees (4.0) and, Employees are given incentives based on quantitative targets (3.6).

The standard deviation on the seven aspects in the study on cost leadership strategies were: High Process engineering skills among employees (0.8), Our products are designed for ease of manufacture (0.9), The organization has sustained access to inexpensive capital (1.2), Management exercises close supervision of labour (0.8), Management always has tight production cost control (0.8), Employees are given incentives based on quantitative targets (1.2), and Management always ensure that all the costs are kept at the minimum possible level (0.8). The standard deviations are low, indicating consensus by all the respondents.

Further, the coefficient of variation on the aspects on cost leadership strategies were: High Process engineering skills among employees (0.20), Our products are designed for ease of manufacture (0.22), The organization has sustained access to inexpensive capital (0.34), Management exercises close supervision of labour (0.18), Management always has tight production cost control (0.17), Employees are given incentives based on quantitative targets (1.32), and Management always ensure that all the costs are kept at the minimum possible level (0.19). The low values of coefficient of variation further shows that respondents were in agreement that advanced manufacturing technology has a positive effect on cost leadership.

Cost leadership strategies are based on managing all the costs in the organization processes to achieve low unit production costs. The results in table 4.16 suggest that advanced manufacturing technologies enable organizations to achieve low costs through managing of production costs which include managing direct material costs, direct labour costs, manufacturing overhead costs. Compared with all the aspects on cost leadership in the study, results show that providing incentives based on production quantity to employees was the least. This aspect has adverse impacts on the quality as employees would be motivated more by the quantities they produce.

4.3.3.2 Differentiation Strategies

Respondents were required to indicate their level of concurrence with aspects relating to differential strategy practices in their organization. Results show that the level of concurrence on the aspects of differentiation strategies were: respondents moderately agreed with all the aspects which included: their organization offers customer service for all purchases of products having, their products were unique, organizations had cultivated a reputable brand image in their industry, the organization employed the most current technology in production, the organization used dealers or agents to distribute their products, and they had loyal customers to their products.

Table 4.17: Differentiation Strategies

Differentiation Indicator	Min	Max	Mean	Std. Deviation	Coefficient of Variation
The organization has cultivated a reputable brand image in the industry	1	5	4.3	0.8	0.18
Our products are unique	1	5	4.2	0.9	0.22
Our customers are loyal to our products	1	5	4.2	0.8	0.18
The organization offers customer service for all purchases of our products	1	5	4.1	1.1	0.28
The organization uses dealers/agents to distribute its products	1	5	4.1	1.2	0.30
The organization employs the most current technology in production	1	5	3.8	1.1	0.28
Average	1	5	**4.1**	**1.0**	**0.24**

Source: Author (2019)

The results from the study on how advanced manufacturing technology impacts the aspects of differentiation strategies and performance revealed that respondents moderately agreed that; the organization has cultivated a reputable brand image in the industry (mean, 4.3), their products were unique (4.2), Their customers were loyal to their products (4.2), their organizations offered customer service for the purchase of all their products (4.1), their organizations used dealers/agents to distribute their products (4.1) and, their organizations applied the most current technology in the production process (3.8). The results are presented in Table 4.17.

The standard deviation on how advanced manufacturing technology impacts the aspects of differentiation strategies and performance were: the organization has cultivated a reputable brand image in the industry (0.8), their products were unique (0.9), Their customers were loyal to their products (0.8), their organizations offered customer service for the purchase of all their products (1.1), their organizations used dealers/agents to distribute their products (1.2) and, their organizations applied the most current technology in the production process (1.1). The low standard deviations show that the respondents did not have divergent views.

Further, the coefficient of variation was: the organization has cultivated a reputable brand image in the industry (0.18), their products were unique (0.22), Their customers were loyal to their products (0.18), their organizations offered customer service for the purchase of all their products (0.28), their organizations used dealers/agents to distribute their products (0.30) and, their organizations applied the most current technology in the production process (0.28).

The mean aggregate score in Table 4.17 on the effect of advanced manufacturing technology, differentiation strategies and organizational performance was 4.1. This result indicates that respondents agree that advanced manufacturing technology influence differentiation strategies and performance in large manufacturing companies in Kenya. This result is supported by the low value of the aggregate standard deviation of 1.0 confirming that most of the respondents had the same opinion and further supported by the low aggregate coefficient of variation at 0.24. However, the respondents with a mean of 3.8 agree that their organizations employ the most current technology with a low standard deviation of 1.1 and coefficient of variation of 0.28. This points to the resilience of advanced manufacturing technology in helping organizations maintain their competitive advantage.

4.3.3.3 Focus Strategies

Respondents were required to indicate the level of their concurrence with two main aspects in relation to focus strategy practices in their organization. Findings of the study revealed that respondents were neutral on whether their organizations focused on a small niche market. Similarly, respondents remained neutral when asked whether their organizations manufactured products that were aimed at a small target market.

The standard deviation on concurrence of respondents with aspects of focus strategies in the study findings were: Organizations focused on a small niche market (1.6) and organizations manufacture products that are aimed at a small target market (1.6). Further, the findings on coefficient of variation on concurrence of respondents with aspects of focus strategies were: Organizations focused on a small niche market (0.58); organizations manufacture products that are aimed at a small target market (0.60). The values for standard deviation and coefficient of variation indicates that there were divergent views on the aspects of focus strategies practices and advanced manufacturing technology. These findings are presented in Table 4.18.

Table 4.18: Focus Strategies

Focus Indicator	Minimum	Maximum	Mean	Std. Deviation	Coefficient of Variation
Focuses on a small niche market	1	5	2.7	1.6	0.58
Manufactures products that are aimed at a small target market	1	5	2.7	1.6	0.6
Average	1	5	**2.7**	**1.6**	**0.59**

Source: Author (2019)

Organizations implement focus strategies in niche or narrow markets to meet more specific needs of customers using cost leadership or differentiation strategies (Davidson, 2001; Porter, 1980, 1985, 1987, Cross, 1999; Hlavacka, 2001). Thompson (2008) identified focus strategies to be effective in developing competitive advantage when organizations satisfy certain operational conditions.

4.3.3.4 Joint Descriptive Statistics for Competitive Advantage

The joint effect of competitive advantage considers the aspects of all the three generic strategies. The findings are presented in table 4.19. and the aggregate score for competitive advantage shows that the mean on the joint effect of competitive advantage was 3.6 with a standard deviation of 1.6 and a coefficient of variation of 0.35.

Table 4.19: Descriptive Statistics for Joint Effect of Competitive Advantage

Competitive Advantage Indicator	Mean	Std. Deviation	Coefficient of Variation
Cost Leadership			
High Process engineering skills among employees	4.1	0.8	0.20
Our products are designed for ease of manufacture	4.2	0.9	0.22
The organization has sustained access to inexpensive capital	3.5	1.2	0.34
Management exercises close supervision of labour	4.3	0.8	0.18
Management always has tight production cost control	4.5	0.8	0.17
Employees are given incentives based on quantitative targets.	3.6	1.2	0.32
Management always ensure that all the costs are kept at the minimum possible level.	4.4	0.8	0.19
Average	**4.1**	**1.0**	**0.23**
Differentiation			
The organization offers customer service for all purchases of our Products	4.1	1.10	0.28
Our products are unique	4.2	0.90	0.22
The organization has cultivated a reputable brand image in the Industry	4.3	0.78	0.18
The organization employs the most current technology in production	3.8	1.10	0.28
The organization uses dealers/agents to distribute its products	4.1	1.20	0.30
Our customers are loyal to our products	4.2	0.80	0.18
Average	**4.1**	**1.00**	**0.24**
Focus			
Focuses on a small niche market	2.7	1.6	0.58
Manufactures products that are aimed at a small target market	2.7	1.6	0.60
Average	**2.7**	**1.6**	**0.59**
Aggregate total	3.6	1.2	0.35

Source: Author (2019)

The results in table 4.19 show that respondents moderately agree that advanced manufacturing technology enable organizations to develop competitive advantage. The low standard deviation observed (1.2) indicates respondents did not have a lot of divergent views on all the aspects of competitive advantage except with regard to focus strategies where a high standard deviation (1.6) was recorded. This finding is also evident in the observed values for coefficient of variation (0.58 and 0.60) by the focus strategies and may be due to the limited aspects that were considered for this generic strategy. It is also possible to infer from these results that large manufacturing companies in Kenya do not implement focus strategies.

The aggregate mean for the generic strategies in Table 4.19 show that; cost leadership had a mean of 4.1, differentiation strategies also had a mean of 4.1 while focus strategies had a mean of 2.7. The results show that while the respondents moderately agreed that advanced manufacturing technology had a positive impact on both cost leadership and differentiation strategy aspects in the study, they were neutral with regard to focus strategies. Although the mean and standard deviation for cost leadership and differentiation were similar, the results in Table 4.21 indicate that the coefficient of variation for differentiation aspects was higher at 0.24 compared to that of cost leadership which was 0.23.

The emphasis on cost control by organizations, which is one of the attributes of cost leadership strategies, was exhibited by the respondents agreeing strongly that management in their organizations always had a tight control on the production costs (the aspect had a mean of 4.5). Further, respondents moderately agreed that their management always ensured that all the costs within the organization were maintained at the minimum possible level (mean of 4.4) while exercising close supervision of labour (mean of 4.3) and simple product designs to maintain low unit production costs (4.2)

Results also show that respondents moderately agreed that their organization offer customer service for all purchases of their products (4.1), had unique products (4.2), had cultivated a reputable brand image in the industry (4.3), employ the most current technology in production (3.8), use dealers/agents to distribute their products (4.1) and that they have loyal customers (4.2). It can be inferred from these results that large manufacturing companies in Kenya use advanced manufacturing technology to operate in broad markets by implementing either the cost leadership or differentiation strategies.

4.3.4 Organizational Resources

The study also investigated the relationship between advanced manufacturing technology, competitive advantage, organizational resources, and performance of large manufacturing companies in Kenya. The study considered resources to include both tangible and intangible resources in the form of assets, physical facilities, and employee capabilities owned by the organization. Respondents were required to indicate the extent to which resources contributed to this relationship. Data was collected using a Likert scale where, 1 = Not at all: 2 = Small extent: 3 = Moderate extent: 4 = Great extent: 5= Very great extent. Results are presented in the next sub-sections.

4.3.4.1 Assets Owned by the Organization

Respondents in the study were required to show their extent of agreement on provided statements in the questionnaire on assets owned by their organizations using the Likert scale with 1 representing not at all and 5 representing to a very great extent. Results using the mean indicate that to a very great extent; organizations had developed a reputable brand name in their industry (mean, 4.5) and the leadership team regularly accessed the organizational inventory (4.5); to a great extent; leaders in organizations pool resources and expertise toward a shared goal (4.3), organizations have an effective product distribution network (4.1), organizations are located in prime areas in relation to their customers (4.2), organizations had strategic partnership contracts with other global manufacturers (3.7), and the organizations had their own registered trademarks (4.0). Further, to a moderate extent, organizations patent their products (3.4).

The standard deviation on respondents' views on the indicators for assets were: The leaders effectively pool resources and expertise toward a shared goal (0.7), The leadership regularly access inventory of the organization (0.6), The organizational has developed a reputable brand name in the industry (0.6), The organization has patented its products (1.4), The organization has an effective product distribution network (1.2), The organization has strategic partnership contracts with other global manufactures (1.5), The organization is located in a prime area in relation to the customers (0.9), and The organization has its own registered trademarks (1.4). the greatest variation was observed on developing strategic partnerships, ownership of trademarks and patenting of products.

Further, the results indicate the coefficient of variation on respondents' views on asset indicators were: The leaders effectively pool resources and expertise toward a shared goal (0.15), The leadership regularly access inventory of the organization (0.13), The organizational has developed a reputable brand name in the industry (0.13), The organization has patented its products (0.36), The organization has an effective product distribution network (0.29), The organization has strategic partnership contracts with other global manufactures (0.41), The organization is located in a prime area in relation to the customers (0.21), and The organization has its own registered trademarks (0.35). Results are presented in table 4.20.

Table 4.20: Assets

Assets Indicator	Min	Max	Mean	Std. Deviation	Coefficient of Variation
The organizational has developed a reputable brand name in the industry	1	5	4.5	0.6	0.13
The leadership regularly access inventory of the organization	1	5	4.5	0.6	0.13
The leaders effectively pool resources and expertise toward a shared goal.	1	5	4.3	0.7	0.15
The organization is located in a prime area in relation to the customers	1	5	4.2	0.9	0.21
The organization has an effective product distribution network	1	5	4.1	1.2	0.29
The organization has its own registered trade marks	1	5	4.0	1.4	0.35
The organization has strategic partnership contracts with other global manufactures	1	5	3.7	1.5	0.41
The organization has patented its products	1	5	3.4	1.4	0.36
Average	1	5	**4.1**	**1.0**	**0.25**

Source: Author (2019)

The aggregate results show that assets owned by the organization contribute to a great extent on the relationship between and among the study variables (Mean 4.1) and considered together with the standard deviation (1.0) and coefficient of variation (0.25), the respondent's views were not very divergent on this observation. These results are similar to the finding in an empirical study by Ongeti and Machuki (2018) on government owned companies in Kenya, which found that the independent effect of tangible resources on performance are statistically significant for current assets owned by an organization.

The results also show that advanced manufacturing technology allows; organizations to develop a reputable brand name in the industry (mean,4.5), management to have regular access to inventory (4.5), and the leaders to effectively pool resources and expertise toward a shared goal (4.3). These asset indicators are regarded by the respondents as the most important in enabling the organizations to improve their performance. The standard deviation of these asset indicators is low ranging between 0.6 and 0.7 which shows that this is a generally held view by most of the respondents. On the other hand, developing strategic partnership contracts with other global manufactures (mean, 3.7) and owning patents for products (mean, 3.4), were not regarded as very important by the respondents and with a standard deviation of 1.5 and 1.4 respectively show that the respondents held divergent views about them.

Further, the respondents had divergent views on their organizations having strategic partnership contracts with other global manufactures (standard deviation 1.5, coefficient of variation 0.41). The other indicators that raised an equally high divergent opinion among the respondents relate to the effectiveness of the product distribution network with standard deviation of 1.2 and a coefficient of variation of 0.29 and ownership of registered trademarks which had a standard deviation of 1.4 and a coefficient of variation of 0.35.

The result show that respondents did not assign high value to the effect of advanced manufacturing technology towards crafting strategic partnerships, developing product distribution networks and having registered trademarks which are part of the manufacturing strategy. Indeed, manufacturing strategy is designed to use resources of the manufacturing system to support the business strategy to meet the business objectives while these are operational outcomes.

4.3.4.2 Physical Facilities Owned by the Organization

The study identified three indicators to be used in the questionnaire on physical facilities owned by the organization. These were; organizations owning sufficient office and production space, organizations owning land for future expansion of their facilities and organizations having a replacement strategy for their production equipment. The findings are presented in Table 4.21.

Table 4.21: Physical Facilities

Physical Facility Indicator	Minimum	maximum	Mean	Std. Deviation	Coefficient of Variation
The organization has sufficient office and production space	1	5	4.3	1.2	0.27
organization owns land for expansion of its facilities	1	5	4	1.4	0.36
The organization has a replacement strategy for its production equipment	1	5	4	1.1	0.26
Average	1	5	**4.1**	**1.2**	**0.3**

Source: Author (2019)

The aggregate score in Table 4.21 shows that the mean was 4.1 and the standard deviation was 1.2. The result shows that respondents agree to a great extent that physical facilities, being organizational resources, influence performance. The low standard deviation shows that only a few respondents held a different opinion. The results also indicate that the mean of the responses on the indicators were; The organization has sufficient office and production space (4.3), organization owns land for expansion of its facilities (4), and the organization has a replacement strategy for its production equipment (4). Further, the standard variation and coefficient of variation provided the level of divergent views by the respondents and were noted as: The organization has sufficient office and production space (1.2, 0.27), organization owns land for expansion of its facilities (1.4, 0.36) and the organization has a replacement strategy for its production equipment (1.1, 0.26) respectively. The responses did not have a lot of variations except on ownership of land for expansion.

4.3.4.3 Employee Capabilities

The study used six indicators on employee capability. The indicators included; encouragement of employees to develop their own skills, availability of a training and development policy that support use of technology in production, an effective performance management system, embracing coaching at the workplace, and a policy on human resource development. The results are presented in Table 4.22.

Table 4.22: Employee Capabilities

Employee Capability Indicators	Min	Max	Mean	Std. Deviation	Coefficient of Variation
The organization encourages employee own skills development	1	5	4.2	0.7	0.16
The organization has a training and development policy that support use of technology in production	1	5	4.0	1.0	0.25
The organization practices an effective performance management system	1	5	4.0	0.7	0.18
The organization embraces coaching at the workplace	1	5	4.0	0.9	0.23
The organization has an overall approach to human resource development	1	5	3.9	1.0	0.25
Human resource development programs are tied to the industry technological needs	1	5	3.8	1.0	0.27
Average	1	5	**4.0**	**0.9**	**0.22**

Source: Author (2019)

Human resource development programs are tied to the industry technological needs. Results on employee capabilities show that: the managers agree to a great extent that; organizations had an overall approach to human resource development, human resource development programs were tied to the industry technological needs in the organization, organization had training and development policies that supported use of technology in production, the organization practices an effective performance management system, the organization encourages employee own skills development, and the organization embraces coaching at the workplace towards employee capabilities and resource within their organizations.

Table 4.22 shows that the aggregate score for employee capabilities mean is 4 and the standard deviation is 0.9. The results show that the respondents to a great extent agree that employee capabilities have an impact on the relationship between advanced manufacturing technology and performance of large manufacturing companies in Kenya. The results also show that the respondents agree to a great extent that their organizations encourage employees to develop their own skills (mean, 4.2), their organization had a training and development policy that supported the use of technology in production (4.0), organizations have a performance management system in place (4), Coaching is embraced at the workplace (4), organizations had an overall approach to human resource development (3.9) and human resource development programs are tied to the industry technological needs (3.8).

The results on variations observed from the respondents using both standard deviation and coefficient of variation indicates that the respondents had more divergent views relating to; human resource development programs being tied to the industry technological needs (standard deviation 1, coefficient of variation 0.27), organizations having training and development policies that support use of technology in production (1, 0.25), and organizations having an overall approach to human resource development (1, 0.25).

Arising from these results, employee capabilities, which are measures related to how well employees carry out the work they are expected to do, contribute to a great extent on the relationship between advanced manufacturing technology, organizational resources and performance of large manufacturing companies in Kenya. Further, advanced manufacturing technology allows employees to improve their skills, aptitude, and any other quality related to effective delivery of the tasks required by the work they are employed to do.

4.3.4.4 Joint Descriptive Statistics for Organizational Resources

The aggregate mean of the results for the joint effect of the indicators of organizational resources on the relationship between advanced manufacturing technology and performance of large manufacturing companies in Kenya was 4.1. This aggregate joint result for organizational resources show that, assets owned by the organization, physical facilities and employee capabilities contribute to a great extent on the relationship between advanced manufacturing technology, organizational resources and performance of large manufacturing companies in Kenya. Results are presented in Table 4.23. The aggregate standard deviation on the dimensions used for organizational resources in the study were: Assets (4.1), physical facilities (4.1) and employee capability (4.0). These results show that the respondents agreed to a great extent that all the dimensions of organizational resources had an impact on advanced manufacturing technology and performance. Further, the results indicate that divergent views were more on the dimension of physical facilities which had a standard deviation of 1.2 and assets (1.0) compared to employee capabilities which had a standard deviation of (0.9).

Further, the joint effect for organizational resources results show that the coefficient of variation for the assets and employee capabilities was the same at 0.25 and were lower than the coefficient of variation for physical assets which was 0.3. This further confirms that the respondents had more divergent views on the impact of physical assets compared to assets and employee capability. From the results, respondents also had divergent views on some indicators of organizational resources including; organizations having patents for their products (Standard deviation 1.4 and coefficient of variation 0.36), organizations having strategic partnership contracts with other global manufactures (1.5, 0.41), organizations having their own registered trademarks (1.4, 0.35) and organizations owning land for expansion of their facilities (1.4, 0.36).

Arising from these results, the organizational indicators that impact the relationship between advanced manufacturing technology and performance of large manufacturing companies in Kenya include: developing a reputable brand name (4.5), regularly access inventory by management (4.5), owning sufficient office and production space (4.3), pooling of resources and expertise toward a shared goal (4.3), location of the organization relative to the customers (4.2) and the organization encouraging employee to develop their own skills (4.2).

Table 4.23: Descriptive Statistics for Organizational Resources

Indicators of Organizational Resources	Min	Max	Mean	Std. Deviation	Coefficient of Variation
Assets					
The leaders effectively pool resources and expertise toward a shared goal.	1	5	4.3	0.7	0.15
The leadership regularly access inventory of the organization	1	5	4.5	0.6	0.13
The organizational has developed a reputable brand name in the industry	1	5	4.5	0.6	0.13
The organization has patented its products	1	5	3.8	1.4	0.36
The organization has an effective product distribution network	1	5	4.1	1.2	0.29
The organization has strategic partnership contracts with other global manufactures	1	5	3.7	1.5	0.41
The organization is located in a prime area in relation to the customers	1	5	4.2	0.9	0.21
The organization has its own registered trade marks	1	5	4.0	1.4	0.35
Physical Facilities					
The organization has sufficient office and production space	1	5	4.3	1.2	0.27
The organization owns land for expansion of its facilities	1	5	4.0	1.4	0.36
The organization has a replacement strategy for its production equipment	1	5	4.0	1.1	0.26
Employee Capabilities					
The organization has an overall approach to human resource development	1	5	3.9	1.0	0.25
Human resource development programs are tied to the industry technological needs	1	5	3.8	1.0	0.27
The organization has a training and development policy that support use of technology in production	1	5	4.0	1.0	0.25
The organization practices an effective performance management system	1	5	4.0	0.7	0.18
The organization encourages employee own skills development	1	5	4.2	0.7	0.16
The organization embraces coaching at the Workplace	1	5	4.0	0.9	0.23
Aggregate Total	1	5	4.1	1.0	0.25

Source: Author (2019)

4.3.5 Organizational Performance

Both financial and non-financial indicators of performance were used to determine the relationship between advanced manufacturing technology, competitive advantage, organizational resources and performance of large manufacturing companies in Kenya. Kaplan and Norton (2015) revisited their balanced scorecard which they had introduced earlier to highlight further that organizational performance indicators can be either financial or non-financial, or both. The balanced scorecard provides organizations with a method they can effectively use to quantify intangible assets.

4.3.5.1 Financial Performance Gross Revenues

The financial performance of the companies was considered for a period of three years 2015, 2016 and 2017. The study used gross revenue as it consists all the financial income generated by the business over a period of time without considering any expenses incurred in the same period. Dividend was not considered as a financial indicator as it does not reflect the true performance in organizations due to different dividend policies that are applied by different organizations. The gross revenues were into a Likert scale of 1-5 as follows: gross revenues less than Ksh. 1 billion = 1; gross revenues between Ksh. 1 billion and Ksh 2 billion = 2; gross revenues between Ksh. 2 billion and Ksh 4 billion = 3; gross revenues between Ksh. 4 billion and Ksh. 6 billion = 4; and gross revenues above Ksh. 6 billion = 5. Results are presented in table 4.24.

Table 4.24: Financial Performance Gross Revenues

Gross Revenue	Mean	Std. Deviation	Coefficient of variation	Log of Mean Gross Revenue
2015	3.3	1.5	0.46	15.0
2016	3.4	1.4	0.41	15.0
2017	3.2	1.4	0.43	14.9
Average	**3.3**	**1.4**	**0.43**	**15.0**

Source: Author (2019)

From the results, the aggregate mean was 3.3 indicating that the average gross revenues for large manufacturing companies in Kenya over the three years considered by the study was between Ksh. 4 billion and Ksh. 6 billion. The results also show that the mean increased between 2015 and 2016 from 3.3 to 4.4 indicating an overall improvement of gross revenues and performance in the organizations that were considered for the study, but dropped in 2017 to 3.2 which was lower than the gross revenues for 2015. This is line with the expected business performance in Kenya as 2017 represented the year when general elections were held which had an adverse effect on business especially large manufacturing companies.

4.3.5.2 Financial Performance Gross Profits

Researchers have used various financial ratios, including gross profits, to determine the performance of an organization (Mochklas, Jusni, & Fatihudin, 2018). Researchers have a leeway on what type of financial ratio thy can use in a study. Generally, the financial ratio is determined by the financial performance of the organization that would lead to comprehensive results and findings. This study used gross profit to determine the financial performance of large manufacturers companies in Kenya. Gross profits represent the profit the organization makes after deducting all the cost of sales.

Data was collected and transformed to allow the researcher carry out descriptive statistics tests using a Likert scale with 1 as the minimum value and 5 the maximum as follows: gross profits below Ksh. 1 million = 1; gross profits between Ksh 1 million and Ksh.100 million = 2; gross profits between Ksh. 100 million and Ksh 300 million = 3; gross profits between Ksh. 300 million and Ksh. 600 million = 4; gross profits above Ksh. 600 million = 5. Results are shown in Table 4.25.

The aggregate mean for the period of the study for gross profits was 3.6 indicating that large manufacturing companies generated an average profit of Ksh. 500 million during this period. The results also show that the gross profit mean for the selected period of the study was: for the year 2015, between Ksh. 100 million and Ksh. 300 million, for the year 2016, between Ksh. 300 million and Ksh. 600 million, while the gross profits for the year 2017 were between Ksh. 100 million and Ksh. 300 million. Gross profits were observed to have increased then dropped between 2015 and 2017 due to the political factors experienced in Kenya in 2017.

Table 4.25: Financial Performance Gross Profits

Gross profits	Mean	Std. Deviation	Coefficient of Variation	Lo of Gross Profits mean
2015	3.4	1.7	0.49	**19.6**
2016	3.8	1.4	0.36	**19.7**
2017	3.4	1.4	0.43	**19.6**
Average	**3.6**	**1.5**	**0.43**	**19.7**

Source: Author (2019)

Further, the findings show that the standard deviation on gross profits reduced between 2015 and 2016 from 1.7 to 1.4 but remained at the same value in 2017. This was also observed with the coefficient of variation which reduced between 2015 and 2016 from 0.49 to 0.36 but increased once more to 0.43 in 2017. The increase in 2017 was occasioned by political factors in Kenya as a result of the general elections that were conducted in 2017.

4.3.5.4 Non-Financial Organizational Performance

Financial reports are considered as the main source of information regarding performance of organizations and are used to evaluate business activities. According to Kotane and Kuzmina-Merlino (2011) management should not rely only on the financial performance to determine organizational performance. Organizations are encouraged to use other non-financial indicators such as product quality, innovations, market share, customer satisfaction, employee satisfaction among others to determine performance as well.

This study used customer satisfaction and employee retention to evaluate the non-financial performance of large manufacturing companies in Kenya. Customer satisfaction is a measure used by organizations to find out the happiness which consumers derive in using their products, services, and capabilities, while employee retention helps organizations to sustain productivity flow, reduce company costs and reduce the time required to train employees.

Data was collected using a Likert scale ranging between 1-5. Respondents were required to agree with one of the following non-financial indicator statements that closely represented how advanced manufacturing technology impacted operations in their organization; where, 1= Strongly disagree: 2=Moderately disagree: 3=Neutral: 4= Moderately agree: 5= Strongly agree. Results on the two dimensions used in this study are presented in the next section.

4.3.5.4 Customer Satisfaction

The study used seven (7) indicators for customer satisfaction to investigate the effect of advanced manufacturing technology on the performance of large manufacturing companies in Kenya. The indicators included: Rating of products by customers, extent to which the products met the needs and expectations of customers on quality and performance, meeting delivery timelines as specified by customers, competitiveness and value of products in the perspective of consumers, rating by customers on their concerns regarding the performance of the product, rating by customers with regard to dealing with them professionally and, the technical support competence levels expected by customers.

Findings from the study show respondents moderately agreed that: Customers rated products from their organization highly (Mean, 4.4), products from their organization met the needs and expectations regarding quality and performance of their customers(4.3), their organization always met the timelines on delivery specified by their customers (4.3), customers always found their products to be competitive and represented best value for total cost of lifetime ownership (4.3), their response to customer concerns were rated highly (4.2), customers rated their organization highly with regard to dealing with them professionally (4.1) and, their technical support met the desired competence levels expected by their customers (4.1). The results are presented in Table 4.26

The standard deviation on customer satisfaction indicators used in the study which provided a measure on the divergent views of respondents was low ranging between 0.7 and 0.9. This indicates that respondents did not have divergent views on these indicators. Further, the coefficient of variation also shows similar results with values ranging between 0.16 and 0.21. The highest variation was observed on the indicator that evaluated how the technical support met the desired competence levels expected by their customers (COV 0.21)

Table 4.26: Customer Satisfaction

Customer Satisfaction Indicator	Minimum	Maximum	Mean	Std. Deviation	Coefficient of variation
Products from our organization are rated highly by our customers	1	5	4.4	0.7	0.16
Products from our organization meet the needs and expectations regarding quality and performance of our customers	1	5	4.3	0.7	0.16
Our organization always meets the timelines on delivery required by our customers	1	5	4.3	0.8	0.18
Our customers always find our products to be competitive and represent best value for total cost of lifetime ownership	1	5	4.3	0.7	0.17
Our customers rate how our organization responds to their concerns highly	1	5	4.2	0.8	0.19
Customers rate our organization highly with regard to dealing with them professionally	1	5	4.1	0.7	0.17
Our technical support meets the desired competence levels expected by our customers	1	5	4.1	0.9	0.21
Average	1	5	4.2	0.7	0.18

Source: Author (2019)

4.3.5.5 Employee Retention

The study used indicators of employee retention to investigate the relationship between advanced manufacturing technology and performance of large manufacturing companies in Kenya. The indicators included: clear communication of organization mission to the employees, the understanding by employees how their jobs align to the organization mission, availability of appropriate tools required by employees to perform their expected roles, employee's motivation to work in their organization, effective communication between managers and employees, employee's recommendation of the organization to prospective employees and, employee's recognition for their achievements.

Findings of the study on aspects of employee retention show that respondents moderately agreed that: The organization clearly conveyed its mission to its employees (Mean, 4.2), employees understood how their jobs aligned with the organization mission(4.1), employees in the organization had the tools and resources they required to do their job (4.1), employees are always happy to work in our organization (4.0), there is effective communication from managers to employees in the organization (4.0), our employees always recommend our organization to prospective employees (3.8) and, employees in the organization receive the right amount of recognition for their work (3.8). Results are presented in Table 4.27.

Arising from these results, clear communication of the company mission to the employees was regarded as the most important indicator and reason leading to satisfactory employee retention. Organizations define their mission using a mission statement which describes the organization, providing reasons for its incorporation and existence. The mission statement also clearly identifies the primary customers that the organization targets to serve by manufacturing specific products that meet the needs of the identified market. The second important indicator identified by the study is the ease with which employees match their work requirements and output to the overall mission of the organization.

The results on standard deviation on the aspects of employee retention as reported by the managers in the survey did not show a lot of divergent views as it had a range between 0.7 and 1.0, with most of the responses having a standard deviation of 0.9. Similarly, the coefficient of variation varied between 0.18 and 0.25 with employee recognition having the highest coefficient of variation of 0.25.

Table 4.27: Employee Retention

Employee retention Indicators	Minimum	Maximum	Mean	Std. Deviation	Coefficient of variation
The organization clearly conveys its mission to its employees.	1	5	4.2	0.9	0.21
Employees understand how their jobs align with the organization mission.	1	5	4.1	0.9	0.23
Employees in the organization have the tools and resources they need to do my job.	1	5	4.1	0.9	0.23
Employees are always happy to work in our organization	1	5	4.0	0.7	0.18
There is good communication from managers to employees in the organization.	1	5	4.0	0.7	0.18
Our employees always recommend our organization to prospective employees	1	5	3.8	0.8	0.21
Employees in the organization receive the right amount of recognition for their work.	1	5	3.8	1.0	0.25
Average	1	5	4.0	0.9	0.22

Source: Author (2019)

The result pertaining to communication show that employee retention emphasizes adoption of effective and appropriate means of communication to address work and technological related problems and issues which ultimately affect organizational performance. This finding is similar to the results by Malika, Elhadi and Wook-Sung Yoo, (2020). Managers surveyed moderately agreed that there was good communication from managers to the employees in the organizations. This flow of communication is excellent in introducing organizational policies to the employees.

Nasir and Mahmood (2018) in their study on effect of employee retention on organizational competence found that organizations use retention of their employees as a human resource strategy. Employee retention involves having the right employees in the right positions within the organization. Organizations also develop a training needs assessment to determine the appropriate training required to improve the skills of employees and allow for either job enrichment or enlargement.

This study investigated how advanced manufacturing technology affects employee retention. Employees consider non-monetary factors as presented in this study, like, understanding how their jobs align to the company mission, good and effective communication between managers and employees, having the appropriate tools including technology to effectively carry out their roles, and recognition in the process of carrying out their respective duties at work, as important towards employee retention. Indeed, managing employee turnover is a big challenge for organizations (Hayward, 2011).

Employee recruitment process can be very expensive when new prospective employees do not have positive information about the organization. New employees seek information about their prospective employers before making informed decisions on changing their jobs as a safeguard to keeping their jobs after recruitment. New employees are also cautious in getting deeply involved in the operations in a new job when they have limited or no communication that is relevant to their work delivery. The findings of this study are therefore favourable to Human Resource Managers as the executives surveyed to a moderate extent said that advanced manufacturing technology made their employees recommended their organizations to prospective employees.

Globalization has made it possible for employees to seek and get employers who are willing to remunerate them according to their skill and education level. Therefore, employee mobility has increased across organizations hampering strategy implementation, as the team of employees keep on shifting from one organization to another similar organization as long as they are promised an incremental benefit in excess of their current earnings. To maintain the same workforce, the working environment should be conducive to the employees to feel they belong. Respondents agree to a moderate extent that employees in their organizations were always happy to work in their organization.

4.4 Tests of Hypotheses

This section presents the results for the tests of hypotheses as guided by the objectives of the study. The objective of the study was to determine the relationship between advanced manufacturing technology, competitive advantage, organizational resources and organizational performance of large manufacturing companies in Kenya. The study investigated four specific objectives. The first specific objective was to establish if there was a significant relationship between advanced manufacturing technology and performance of large manufacturing companies in Kenya. Advanced manufacturing technology which was the independent variable of the study was operationalized through design technologies, manufacturing technologies and planning technologies while both financial and non-financial indicators were used to operationalize organizational performance.

The second specific objective of the study was to ascertain the role of competitive advantage on the relationship between advanced manufacturing technology and performance of large manufacturing companies in Kenya. Competitive advantage was operationalized using cost leadership strategies, differentiation strategies and focus strategies. The third specific objective was to determine the effect of organizational resources on the relationship between advanced manufacturing technology and performance of large manufacturing companies in Kenya. Organizational resources as a variable were operationalized in terms of assets, physical facilities and employee capabilities.

The fourth specific objective was to establish the joint effect of advanced manufacturing technology, competitive advantage and organizational resources on performance of large manufacturing companies in Kenya. Financial and non-financial indicators were used to operationalize the performance of large manufacturing companies in Kenya. Financial indicators included the financial performance of the organizations for three years (2015, 2016, and 2017) while non-financial indicators included customer satisfaction and employee retention. The study developed hypotheses to investigate the specific objectives of the study which were tested one at a time and to establish the statistical significance in the test of each hypothesis, various forms of regression analysis were used. The study adopted 95% confidence level in every inferential statistics test. The results for the first objective and hypothesis one are presented in the next section.

4.4.1 Advanced Manufacturing Technology and Performance of Large Manufacturing Companies in Kenya.

The first specific objective of the study was addressed using the following hypothesis:

H_1: There is a significant relationship between advanced manufacturing technology and performance of large manufacturing companies in Kenya

Simple regression analysis was used to test this hypothesis. The results are presented in Table 4.28. The model summary shows a moderately strong positive relationship between advanced manufacturing technology and performance of large manufacturing companies in Kenya (R=0.565). Results from the model summary also show that advanced manufacturing technology accounts for 31.9% of variations in performance of large manufacturing companies in Kenya while 68.1% of performance is accounted for by other extraneous factors (R^2= 0.319). These results show that advanced manufacturing technology has a positive effect on the performance of large manufacturing organizations and the finding suggest that organizations that invest in advanced manufacturing technology and implement it appropriately realize better performance in the industry compared to organizations that fail to embrace advanced manufacturing technology or do not implement it appropriately.

Results in Table 4.28 also provide the ANOVA summary statistics for the effect of advanced manufacturing technology on performance of large manufacturing companies in Kenya. The results show a significant F-ratio at a confidence level of 95% (F=19.662, p< .05). This is evidence that the regression model attained goodness of fit and was thus appropriate for analyzing data for this study.

Regression coefficients on the effect of advanced manufacturing technology on performance of large manufacturing companies in Kenya are presented in Table 4.28. The results show that advanced manufacturing technology statistically predicts performance of large manufacturing companies in Kenya at a confidence level of 95% (β=.318, t = 4.434, p< .05). This implies that a unit change in advanced manufacturing technology explains 0.318 of variance in performance of large manufacturing companies in Kenya. Arising from these results, we fail to reject hypothesis one (**H_1**) that there is a significant relationship between advanced manufacturing technology and performance of large manufacturing companies in Kenya.

Table 4.28: Regression Outcomes for the effect of Advanced Manufacturing Technology on Performance of Large Manufacturing Companies in Kenya

Model	Results					
Summary	R	R Square	Adjusted R Square		Std. Error of the Estimate	
	.565[a]	0.319	0.303		0.43722	
ANOVA		Sum of Squares	Df	Mean Square	F	Sig.
	Regression	3.759	1	3.759	19.662	.000[b]
	Residual	8.029	42	0.191		
	Total	11.787	43			
Coefficients		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
	(Constant)	3.142	0.23		13.677	0.000
	Advanced Manufacturing Technology	0.318	0.072	0.565	4.434	0.000
a. Dependent Variable: Performance of Large Manufacturing Companies in Kenya						
b. Predictors: (Constant), Advanced Manufacturing Technology						

Source: Author (2019)

From the regression output in Table 4.28 regression model for the test of hypothesis one can be specified as follows:

$$\mathbf{Y = 3.142 + 0.318\ AMT + \varepsilon}$$

The fitted regression model shows a linear positive relationship between advanced manufacturing technology and performance of large manufacturing companies in Kenya with a gradient of 0.318, and an intercept of 3.142.

4.4.2 Advanced Manufacturing Technology, Competitive Advantage and Performance of Large Manufacturing Companies in Kenya

Objective two was set to investigate the mediating role of competitive advantage (CA) in the relationship between advanced manufacturing technology (AMT) and performance of large manufacturing companies in Kenya (Y). To accomplish this, the following hypothesis was formulated and tested using the four-step path model proposed by Baron and Kenny (1986), Kenny (2018) and Rockwood and Hayes (2020).

H_2: Competitive advantage mediates the relationship between advanced manufacturing technology and performance of large manufacturing companies in Kenya.

The four steps suggested by Baron and Kenny (1986) and Kenny (2018) are interpreted as follows:

Step I: Analysis using simple linear regression is used to confirm the significance of the relationship between the independent and dependent study variables. This step is used in the study to show whether a significant relationship exists between the two variables. Mediation by a third variable can exist in a relationship between two variables only when there is a significant relationship between them. If the effect is significant, the study proceeds to the second step of mediation, as potential for mediation would have been supported.

Step II: Once again simple linear regression is used to test the significance of the relationship between the independent variable of the study and the mediator as the dependent variable. This is used to confirm whether there is a significant relationship between the two variables. If the effect is significant, a high chance of mediation exists and the test for mediation proceeds to the third step.

Step III: The mediator is used as the independent variable in simple linear regression analysis to determine the significance of the relationship between the dependent variable and the mediator. Once again if the effect is significant, the test proceeds to the fourth step as there is a high chance for mediation. However, if the effect is not significant, the process is terminated, since the possibility of mediation does not exist. The three steps are used to determine whether zero-order relationships among the study variables exist or does not exist.

Step IV: The last step of the model proposed by Baron and Kenny (1987) and Kenny (2018) is used to finally confirm mediation between the independent variable and the dependent variable. In this step, the dependent variable is regressed on the independent variable and the mediator simultaneously. Multiple regression analysis is used to carry out the mediation test by controlling the mediating variable and testing the significance of the independent variable. Mediation is supported by the multiple regression analysis results if the effect of the mediator remains significant after controlling for the independent variable.

If the independent variable is not significant when the mediator is controlled, the finding supports full mediation. If the independent variable is not significant but has a positive value above zero, partial mediation is implied. In this study, the independent variable was advanced manufacturing technology, the dependent variable was performance of large manufacturing companies in Kenya, while the mediating variable was competitive advantage. The results of the test of the second hypothesis ($\mathbf{H_2}$) are presented in the following section.

Step I: Advanced Manufacturing Technology and Performance of Large Manufacturing Companies in Kenya

In the first step, a simple regression analysis was performed with advanced manufacturing technology (AMT) predicting performance of large manufacturing companies in Kenya (Y). Fig 4.5 shows Step I of the mediation test in the relationship between advanced manufacturing technology and performance of large manufacturing companies in Kenya. The findings of Step I are presented in table 4.29.

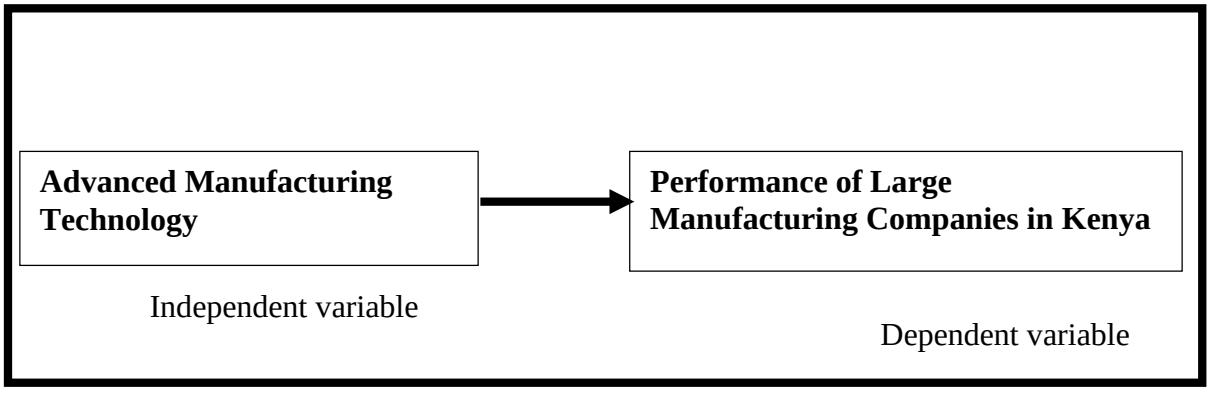

Fig 4.5: Advanced ManufacturingTechnology and Performance of Large Manufacturing Companies in Kenya

Table 4.29: Regression Outcomes for the effect of Advanced Manufacturing Technology on Performance of Large Manufacturing Companies in Kenya

Model	**Results**					
Summary	R	R Square	Adjusted R Square		Std. Error of the Estimate	
	.565[a]	0.319	0.303		0.43722	
ANOVA		Sum of Squares	df	Mean Square	F	Sig.
	Regression	3.759	1	3.759	19.662	.000[b]
	Residual	8.029	42	0.191		
	Total	11.787	43			
Coefficients		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
	(Constant)	3.142	0.23		13.677	0.000
	Advanced Manufacturing Technology	0.318	0.072	0.565	4.434	0.000
a. Dependent Variable: Performance of Large manufacturing Companies in Kenya						
b. Predictors: (Constant), Advanced Manufacturing Technology						

Source: Author (2019)

The results in Table 4.29 show a significant F-ratio (F= 19.662, p <.005). These results confirm that the regression model attained goodness of fit, justifying the use of simple linear regression. The effect of advanced manufacturing technology on performance of large manufacturing companies in Kenya is also supported by the significance of the beta coefficient (β=.318, t = 4.434, p< .05), which means that a unit change in advanced manufacturing technology causes a change in large manufacturing companies performance by 31.9%.

There is evidence from these results that the first condition for inferring mediation is satisfied. The process therefore proceeds to Step II. From the regression output in Table 4.29 regression equation for step I of the mediation model can be specified as follows:

$$\mathbf{Y = 3.142 + 0.318\ AMT + \varepsilon}$$

Step II: Advanced Manufacturing Technology and Competitive Advantage

In the second step, competitive advantage was regressed on advanced manufacturing technology. The findings are presented in Table 4.30.

Table 4.30: Regression Outcomes for the effect of Advanced Manufacturing Technology on Competitive Advantage

Model	**Results**					
Summary	R	R Square	Adjusted R Square	Std. Error of the Estimate		
	.574[a]	0.329	0.313	0.4499		
ANOVA[a]		Sum of Squares	Df	Mean Square	F	Sig.
		4.176	1	4.176	20.63	.000[b]
	Residual	8.501	42	0.202		
	Total	12.677	43			
Coefficients[a]		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
	(Constant)	2.888	0.236		12.217	0.000
	Advanced Manufacturing Technology	0.335	0.074	0.574	4.542	0.000
a. Dependent Variable: Competitive Advantage						
b. Predictors: (Constant), Advanced Manufacturing Technology						

Source: Author (2019)

The model summary shows a moderately strong positive relationship between advanced manufacturing technology and competitive advantage (R=0.574). Results from the model summary also show that advanced manufacturing technology accounts for 32.9% of variations in competitive advantage while 67.1% of competitive advantage is accounted for by other extraneous factors (R^2= 0.329). These results show that advanced manufacturing technology has a positive effect on competitive advantage.

Results in Table 4.30 also provide the ANOVA summary statistics for the effect of advanced manufacturing technology on competitive advantage. The results show a significant F-ratio at a confidence level of 95% (F=20.63, p< .05). This is evidence that the regression model attained goodness of fit and was thus appropriate for analyzing data for this study. Regression coefficients for the effect of advanced manufacturing technology on competitive advantage are also presented in Table 4.30. The analysis results show that advanced manufacturing technology statistically predicts the value of competitive advantage at a confidence level of 95% (β=.335, t = 4.542, p< .05). This implies that a unit change in advanced manufacturing technology explains 0.335 of variance in competitive advantage.

The regression for Step II can be specified as follows:

$$\mathbf{Y=2.888 + 0.335\ AMT + \varepsilon}$$

Arising from these results, there is a significant relationship between advanced manufacturing technology and competitive advantage and there is evidence from these results that the second condition for inferring mediation is satisfied. The process therefore proceeds to Step III.

Step III: Competitive Advantage and Performance of Large Manufacturing Companies in Kenya

In the third step, a simple linear regression analysis was used to determine the effect of competitive advantage on performance of large manufacturing companies in Kenya. The model summary in Table 4.31 shows a moderately strong positive relationship between competitive advantage and performance of large manufacturing companies in Kenya (R= 0.540). The results also show that competitive advantage explained 29.2% of change in performance of large manufacturing companies in Kenya (R^2=0.292)

Table 4.31: Regression Outcome for the effect of Competitive Advantage on Performance of Large Manufacturing Companies in Kenya

Model	**Results**					
Summary	R	R Square	Adjusted R Square	Std. Error of the Estimate		
	.540[a]	0.292	0.275	0.44589		
ANOVA[a]		Sum of Squares	df	Mean Square	F	Sig.
	Regression	3.437	1	3.437	17.286	.000[b]
	Residual	8.35	42	0.199		
	Total	11.787	43			
Coefficients[a]		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
	(Constant)	2.079	0.495		4.199	0.000
	Competitive Advantage	0.521	0.125	0.54	4.158	0.000
a. Dependent Variable: Performance of Large Manufacturing Companies in Kenya						
b. Predictors: (Constant), Competitive Advantage						

Source: Author (2019)

Regression coefficients for the effect of competitive advantage on performance of large manufacturing companies in Kenya in Step III of the mediation model are presented in Table 4.31. The ANOVA results in the table show a significant F-ratio ($F= 17.286$, $p <.005$) which confirms that the regression model was fit for use in the analysis. The results show that advanced manufacturing technology has a significant effect on performance of large manufacturing companies in Kenya ($\beta=.521$, $t = 4.158$, $p< .05$). This suggests that one unit of increase in competitive advantage increases performance of large manufacturing companies in Kenya by 0.521. Regression model for Step III can be specified as follows:

$$\mathbf{Y=2.079 + 0.521\ AMT + \varepsilon}$$

Arising from these results, there is a significant relationship between competitive advantage and performance of large manufacturing companies in Kenya and there is evidence from these results that the third condition for inferring mediation is satisfied. The process therefore proceeds to Step IV.

Step IV: Advanced Manufacturing Technology, Competitive Advantage and Performance of Large Manufacturing Companies in Kenya

The fourth step involved a multiple regression model with advanced manufacturing technology (AMT) and competitive advantage (CA) as predictor variables and performance of large manufacturing companies in Kenya (Y) as the criterion variable. Results are presented in Table 4.32. As illustrated in the table, there is a strong correlation among advanced manufacturing technology, competitive advantage and performance of large manufacturing companies in Kenya (R=0.623). The results also show that advanced manufacturing technology and competitive advantage together explained 38.8% of change in performance of large manufacturing companies in Kenya ($R^2 = 0.388$).

The ANOVA results in Table 4.32 show a significant F-ratio (F= 13.017, p <.005). These results confirm that the regression model attained fitness justifying the use of multiple regression model. The table also presents the regression coefficients for the effect of advanced manufacturing technology and competitive advantage on performance of large manufacturing companies in Kenya. The analysis results show that advanced manufacturing technology statistically predicts the value of performance of large manufacturing companies in Kenya in the presence of competitive advantage at a confidence level of 95% (β=.380, t = 2.547, p<.05). This suggests that one unit of increase in advanced manufacturing technology in the presence of competitive advantage increases performance of large manufacturing companies in Kenya by 0.380.

Further, table 4.32 also shows that competitive advantage is also significant in predicting performance of large manufacturing companies in Kenya in the presence of advanced manufacturing technology (β=.322, t = 2.158, p< .05). This suggests that one unit of increase in competitive advantage in the presence of advanced manufacturing technology increases performance of large manufacturing companies in Kenya by 0.322. The regression model for Step IV can be specified as follows: **$Y=2.246 + 0.380\ AMT + 0.322\ CA + \varepsilon$**

Table 4.32: Regression Outcomes for the Effect of Advanced Manufacturing Technology and Competitive Advantage on Performance of Large Manufacturing Companies in Kenya

Model	**Results**					
Summary	R	R Square	Adjusted R Square	Std. Error of the Estimate		
	.623[a]	0.388	0.359	0.41933		
ANOVA[a]		Sum of Squares	Df	Mean Square	F	Sig.
	Regression	4.578	2	2.289	13.017	.000[b]
	Residual	7.209	41	0.176		
	Total	11.787	43			
Coefficients[a]		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
	(Constant)	2.246	0.47		4.776	0.000
	Advanced Manufacturing Technology	0.214	0.084	0.380	2.547	0.015
	Competitive Advantage	0.310	0.144	0.322	2.158	0.037
a. Dependent Variable: Performance of Large Manufacturing Companies in Kenya						
b. Predictors: (Constant), Competitive Advantage, Advanced Manufacturing Technology						

Source: Author (2019)

To confirm full mediation in the study, it is required that, the coefficient for the effect of competitive advantage on performance of large manufacturing companies in Kenya must be significant while the coefficient for the effect of advanced manufacturing technologies on performance of large manufacturing companies in Kenya should not be significant. These results show that full mediation was not confirmed. Arising from these results, we reject hypothesis two (**H_2**) on full mediation that competitive advantage mediates the relationship between advanced manufacturing technology and performance of large manufacturing companies in Kenya. The summary for mediation is presented in Table 4.33

Table 4.33: Summary of Findings of the Test of Mediation

Step	Regression Model Results	Interpretation of results
Step I: Effect of advanced manufacturing technology (AMT), on performance of large manufacturing companies in Kenya (P)	Simple regression model with AMT predicting P. Specified regression equation: $P = 3.142 + 0.318\ AMT + \varepsilon$	Results: F= 19.662, p <.005 Effect of AMT on P was significant and the study Proceeded to Step II as potential for mediation was confirmed.
Step II: Effect of advanced manufacturing technology (AMT) on competitive advantage (M)	Simple regression with AMT predicting Competitive advantage. Specified regression equation: **$M=2.888 + 0.335\ AMT + \varepsilon$**	Results: F=20.63, p< .05 Effect of AMT on competitive advantage was significant and the study proceeded to Step III as a high chance of mediation exists.
Step III: Effect of competitive advantage (M) on performance of large manufacturing companies in Kenya (P)	Simple regression analysis with competitive advantage predicting P. Specified regression equation: **$Y=2.079 + 0.521\ AMT + \varepsilon$**	Results: F= 17.286, p <.005 Effect of competitive advantage on performance of large manufacturing companies in Kenya was significant and the study proceeded to Step IV as there is a high chance of full mediation
Step IV: Effect of advanced manufacturing technology (AMT) and competitive advantage (M) on performance of large manufacturing companies in Kenya (P)	Multiple regression with AMT and M Predicting P Specified regression equation **$P=2.246 + 0.214\ AMT + 0.310\ M + \varepsilon$**	Results: a) β=.310, t = 2.158, p< .05 Competitive advantage was significant and, b) β=.214, t = 2.547, p<.05 AMT was also significant c) Arising from these results, we reject hypothesis two (**H_2**) on FULL mediation that competitive advantage mediates the relationship between advanced manufacturing technology and performance of large manufacturing companies in Kenya

Source: Author (2019)

4.4.3 Advanced Manufacturing Technology, Organizational Resources and Performance of Large Manufacturing Companies in Kenya.

The third objective of the study was to determine the effect of organizational resources on the relationship between advanced manufacturing technology and performance of large manufacturing companies in Kenya. To accomplish this, the following hypothesis was formulated and tested using the three-step model (Baron & Kenny, 1986; Kenny, 2018).

H_3: The relationship between advanced manufacturing technology and performances of large manufacturing companies in Kenya is moderated by organizational resources

The three steps suggested by Kenny (2018) and Baron and Kenny (1986) are interpreted as:

Step I: Simple linear regression analysis is used to confirm the significance of the relationship between the independent and dependent study variables. This step is used in the study to show whether a significant relationship exists between the two variables which is a pre-requisite for moderation. This step allows the next steps of moderation to determine the effect of the moderator on the relationship between the independent variable and the dependent variable.

Step II: Multiple regression analysis with the independent variable and the moderating variable as predictors and the dependent variable as the criterion variable is done. The analysis is used to determine the effect of both variables on the dependent variable as well as the model which should be significant for the analysis to proceed to the third step.

Step III: The interaction term of the independent variable and the moderator variable is introduced in the multiple regression model that was used to analyze the independent variable, moderating variable and the dependent variable. To confirm moderation, the effect of the interaction term should be significant. Complete moderation occurs when the independent variable and the moderator variable are not significant with the interaction term added or If the independent variable and moderator are significant after adding the interaction term. Data collected in the study on advanced manufacturing technology as the independent variable, organizational resources as the moderating variable and performance of large manufacturing companies in Kenya as the dependent variable were used in this analysis. The results of the test of the third hypothesis (H_3) are presented in the following section.

The first step of testing for moderation used simple regression analysis to test the relationship between advanced manufacturing technology and performance of large manufacturing companies in Kenya. The results are presented in Table 4.34 model 1. The model summary shows a moderately strong positive relationship between advanced manufacturing technology and performance of large manufacturing companies in Kenya (R=0.565). Results from the model summary also show that advanced manufacturing technology accounts for 31.9% of variations in performance of large manufacturing companies in Kenya (R^2= 0.319).

Results in Table 4.34 model 1 also provide the ANOVA summary statistics for the effect of advanced manufacturing technology on performance of large manufacturing companies in Kenya. The results show a significant F-ratio at a confidence level of 95% (F=19.662, p< .05). This is evidence that the regression model attained goodness of fit and was thus appropriate for analyzing data for this study.

Regression coefficients for the effect of advanced manufacturing technology on performance of large manufacturing companies in Kenya presented in Table 4.34 model 1 show that advanced manufacturing technology statistically predicts the value of performance of large manufacturing companies in Kenya at a confidence level of 95% (β=.318, t = 4.434, p< .05). This implies that a unit change in advanced manufacturing technology explains 0.318 of variance in performance of large manufacturing companies in Kenya. Arising from these results, the analysis proceeds to the second step of testing for moderation in which multiple linear regression analysis was done to establish the joint effect of organizational resources and advanced manufacturing technology on performance of large manufacturing companies in Kenya.

The results for step two are presented in Table 4.34 model 2 and show a strong relationship among organizational resources, advanced manufacturing technology and performance of large manufacturing companies in Kenya (R=0.698). Results from the model summary also show the joint effect of advanced manufacturing technology and organizational resources accounts for 48.7% of variations in performance of large manufacturing companies in Kenya (R^2= 0.487). Further, The ANOVA results in Table 4.34 model 2 show a significant F-ratio (F= 19.429, p <.005). This confirms that the regression model attained goodness of fit, justifying use of multiple regression model.

Table 4.34: Combined Regression Analysis Results for Moderation Test

Model	Summary				
	R	R Square	Adjusted R Square	Std. Error of the Estimate	
1	.565[a]	0.319	0.303	0.43722	
2	.698[a]	0.487	0.462	0.38419	
3	.702[a]	0.493	0.455	0.38662	
	Anova				
			F	Sig.	
1		Regression	19.662	.000b	
2		Regression	19.429	.000b	
3		Regression	12.952	.000b	
	Coefficients				
		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error			
1	(Constant)	3.142	0.23		13.677	0.000
	Advanced Manufacturing Technology	0.318	0.072	0.565	4.434	0.000
2	(Constant)	1.912	0.392		4.876	0.000
	Advance Manufacturing Technology	0.199	0.071	0.353	2.802	0.008
	Organizational Resources	0.391	0.107	0.461	3.66	0.001
3	(Constant)	1.244	1.037		1.199	0.237
	Advanced Manufacturing Technology	0.471	0.397	0.837	1.186	0.242
	Organizational Resources	0.565	0.272	0.666	2.079	0.044
	(OR *AMT)	-0.069	0.098	0.611	-0.697	0.49

Source: Author (2019)

Model 1: Predictors, Advanced manufacturing technology; Dependent variable, performance of large manufacturing companies in Kenya.

Model 2: Predictors, organizational resources, Advanced manufacturing technology; Dependent variable, performance of large manufacturing companies in Kenya.

Model 3: Predictors, (OR*AMT), Organizational resources, Advanced manufacturing technology; Dependent variable, Performance of large manufacturing companies in Kenya

The table also presents the regression coefficients for the effect of advanced manufacturing technology and organizational resources on performance of large manufacturing companies in Kenya. The analysis results show that advanced manufacturing technology statistically predicts the value of performance of large manufacturing companies in Kenya in the presence of organizational resources at a confidence level of 95% (β=.353, t = 2.802, p<.05). This suggests that one unit of increase in advanced manufacturing technology in the presence of organizational resources increases performance of large manufacturing companies in Kenya by 0.353.

Further, table 4.34 model 2 show that organizational resources is also significant in predicting performance of large manufacturing companies in Kenya in the presence of advanced manufacturing technology (β=.461, t = 3.660, p< .05). This suggests that one unit of increase in organizational resources in the presence of advanced manufacturing technology increases performance of large manufacturing companies in Kenya by 0.461. Arising from these results, there is a significant relationship between advanced manufacturing technology and organizational resources on the performance of large manufacturing companies in Kenya and there is evidence from these results that the second condition for inferring moderation is satisfied as both the variables in the model and the model itself are significant. The process therefore proceeds to the third step of testing for moderation.

In the third step, the interaction term (OR*AMT) was introduced into the regression model that had advanced manufacturing technology and organizational resources. Performance of large manufacturing companies in Kenya was then regressed on the three predictors. Results are presented in Table 4.34 model 3. As shown in the table, the relationship among advanced manufacturing technology, organizational resources, the interaction term (OR*AMT) and performance of large manufacturing companies in Kenya is strong (R=0.702). The results also show that advanced manufacturing technology, organizational resources and the interaction term (OR*AMT) together explained 49.3% of change in performance of large manufacturing companies in Kenya (R^2 = 0.493). The ANOVA results in Table 4.34 model 3 show a significant F-ratio (F= 12.952, p <.005). These results confirm that the regression model attained fitness justifying the use of multiple regression model.

Regression coefficients for the three steps of moderation show that in the first step in Table 4.34 model 1, advanced manufacturing technology statistically predicts the value of performance of large manufacturing companies in Kenya at a confidence level of 95% (β=.318, t = 4.434, p< .05). In the second step, advanced manufacturing technology statistically predicts the value of performance of large manufacturing companies in Kenya in the presence of organizational resources at a confidence level of 95% (β=.353, t = 2.802, p<.05) and also organizational resources is significant in predicting performance of large manufacturing companies in Kenya in the presence of advanced manufacturing technology (β=.461, t = 3.660, p< .05). In the third step, the β coefficients of advanced manufacturing technology was 0.837 while the β coefficient of organizational resources was 0.666.

Further, the table also presents the regression coefficients for the effect of advanced manufacturing technology, organizational resources and the interaction term on performance of large manufacturing companies in Kenya. The analysis results show that advanced manufacturing technology does not statistically predict the value of performance of large manufacturing companies in Kenya in the presence of organizational resources and the interaction term at a confidence level of 95% (β=.837, t = 1.186, p>.05). The results also show that organizational resources statistically predict the value of performance of large manufacturing companies in Kenya in the presence of advanced manufacturing technology and the interaction term (OR*AMT) at a confidence level of 95% (β=.666, t = 2.079, p<.05).The results in Table 4.34 also show that the interaction term is not significant in the relationship between advanced manufacturing technology and organizational resources with performance of large manufacturing companies in Kenya (β= -0.611, t = -0.697, p>.05)

The results in step three of the moderation model provided insufficient evidence to support the third hypothesis (**H_3**) that the relationship between advanced manufacturing technology and performance of large manufacturing companies in Kenya is moderated by organizational resources. Arising from these results, we reject Hypothesis three (**H3**) that resources moderate the relationship between advanced manufacturing technology and performance of large manufacturing companies in Kenya. These results contradict Prescott (1986) results that environment modify the strength of the relationship between strategic variables and performance.

Table 4.35: Summary of Findings of the Test of Moderation

Step	Regression Model Results	Interpretation of results
Step I: Effect of advanced manufacturing technology (AMT), on performance of large manufacturing companies in Kenya (P)	Simple regression model with AMT predicting P. Specified regression equation: $P = 3.142 + 0.318\ AMT + \varepsilon$	Results: F= 19.662, p <.005 Effect of AMT on P was significant and the study Proceeded to Step II as potential for moderation in the relationship between advanced manufacturing technology and performance of large manufacturing companies in Kenya was confirmed.
Step II: Multiple regression with advanced manufacturing technology and organizational resources as the predictor variables and performance of large manufacturing companies in Kenya as criterion variable	Effect of advanced manufacturing technology on performance of large manufacturing companies in Kenya in the presence of organizational resources. Results at a confidence level of 95% β=.353, t = 2.802, p<.05.	The analysis results show that advanced manufacturing technology statistically predicts the value of performance of large manufacturing companies in Kenya in the presence of organizational resources.
	Effect of organizational resources on performance of large manufacturing companies in Kenya in the presence of advanced manufacturing technology. Results at a confidence level of 95% β=.461, t = 3.660, p< .05.	Results show that organizational resources is significant in predicting performance of large manufacturing companies in Kenya in the presence of advanced manufacturing technology
	The model was significant with F= 19.429, and p <.005. Proceed to step III as potential for moderation exists.	
Step III: Effect of interaction term (AMT*OR) on the multiple regression of advanced manufacturing technology and organizational resources on performance of large manufacturing companies in Kenya	Multiple regression with the interaction term (AMT*OR) introduced in the multiple regression in STEP II. Effect of the interaction term (AMT*OR) at a confidence of 95% β= -0.611, t = -0.697, p>.05)	Results show that the interaction term is not significant in the relationship between advanced manufacturing technology and organizational resources with performance of large manufacturing companies in Kenya. Hence we reject hypothesis (**H_3**).

Source: Author (2019)

4.4.4 The Joint Effect of Advanced Manufacturing Technology, Competitive Advantage, Organizational Resources on Performance of Large Manufacturing Companies in Kenya.

The study sought to establish whether the joint effect of advanced manufacturing technology, competitive advantage and organizational resources was greater than their individual effects on performance of large manufacturing companies in Kenya. The following hypothesis was formulated and tested:

H_4: There is a significant joint effect of advanced manufacturing technology, competitive advantage and, organizational resources on the performance of large manufacturing companies in Kenya.

Simple and multiple linear regression analyses were used to test this hypothesis. The results are presented in table 4.35, 4.36, 4.37 and 4.38. The simple linear regression analyses were performed to allow for comparison of the findings with the findings of the joint effect of all the three predictor variables on the performance of large manufacturing companies in Kenya.

The results in Table 4.35 indicate a moderately strong and significant relationship between advanced manufacturing technology and performance of large manufacturing companies in Kenya (R=0.565). Results from the model summary also show that advanced manufacturing technology accounts for 31.9% of variations in performance of large manufacturing companies in Kenya (R^2= 0.319). Further, the ANOVA and coefficient summary statistics show a significant F-ratio at a confidence level of 95% (F=19.662, p< .05) and also that advanced manufacturing technology statistically predicts the value of performance of large manufacturing companies in Kenya at a confidence level of 95% (β=.318, t = 4.434, p< .05).

The model summary results in Table 4.36 show a moderately strong positive relationship between competitive advantage and performance of large manufacturing companies in Kenya (R=0.540). Results from the model summary also show that competitive advantage accounts for 29.2% of variations in performance of large manufacturing companies in Kenya while 70.8% of performance is accounted for by other extraneous factors (R^2= 0.292). These results show that competitive advantage has a positive effect on the performance of large manufacturing organizations and the finding suggest that competitive advantage allows large manufacturing companies in Kenya to improve their performance.

Table 4.36: Regression Outcomes for the effect of Advanced Manufacturing Technology on Performance of Large Manufacturing Companies in Kenya

Model	Results					
Summary	R	R Square	Adjusted R Square		Std. Error of the Estimate	
	.565[a]	0.319	0.303		0.43722	
	a. Predictors: (Constant), Advanced Manufacturing Technology					
ANOVA		Sum of Squares	df	Mean Square	F	Sig.
	Regression	3.759	1	3.759	19.662	.000[b]
	Residual	8.029	42	0.191		
	Total	11.787	43			
	a. Dependent Variable: Organizational Performance					
	b. Predictors: (Constant), Advanced Manufacturing Technology					
Coefficients		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
	(Constant)	3.142	0.23		13.677	0.000
	Advanced Manufacturing Technology	0.318	0.072	0.565	4.434	0.000
	a. Dependent Variable: Organizational Performance					

Source: Author (2019)

Results in Table 4.36 also provide the ANOVA summary statistics for the effect of competitive advantage on performance of large manufacturing companies in Kenya. The results show a significant F-ratio at a confidence level of 95% ($F=17.286$, $p< .05$). Further, regression coefficients for the effect of competitive advantage on performance of large manufacturing companies in Kenya in Table 4.36 show that competitive advantage statistically predicts the value of performance of large manufacturing companies in Kenya at a confidence level of 95% ($\beta=.521$, $t = 4.151$, $p< .05$). This implies that a unit change in competitive advantage explains 0.521 of variance in performance of large manufacturing companies in Kenya.

Table 4.37: Regression Outcome for the effect of Competitive Advantage on Performance of Large Manufacturing Companies in Kenya

Model	Results					
Summary	R	R Square	Adjusted R Square	Std. Error of the Estimate		
	.540[a]	0.292	0.275	0.44589		
	a. Predictors: (Constant), Competitive Advantage					
ANOVA[a]		Sum of Squares	df	Mean Square	F	Sig.
	Regression	3.437	1	3.437	17.286	.000[b]
	Residual	8.35	42	0.199		
	Total	11.787	43			
	a. Dependent Variable: Organizational Performance					
	b. Predictors: (Constant), Competitive Advantage					
Coefficients[a]		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
	(Constant)	2.079	0.495		4.199	0.000
	Competitive Advantage	0.521	0.125	0.54	4.158	0.000
	a. Dependent Variable: Organizational Performance					

Source: Author (2019)

The results in Table 4.37 indicate a strong and significant correlation between organizational resources and performance of large manufacturing companies in Kenya (R=0.623). Results from the model summary also show that organizational resources accounts for 38.8% of variations in performance of large manufacturing companies in Kenya (R^2= 0.388). Further, the ANOVA and coefficient summary statistics show a significant F-ratio at a confidence level of 95% (F=26.655, p< .05) and also that organizational resources statistically predict the value of performance of large manufacturing companies in Kenya at a confidence level of 95% (β=.528, t = 5.163, p< .05). This implies that a unit increase in organizational resources increases performance of large manufacturing companies in Kenya by 0.528 units.

Table 4.38: Regression Outcome for the effect of Organizational Resources on Performance of Large Manufacturing Companies in Kenya

Model	Results					
Summary	R	R Square	Adjusted R Square	Std. Error of the Estimate		
	.623a	0.388	0.374	0.41435		
	a. Predictors: (Constant), Organizational Resources					
Anova		Sum of Squares	df	Mean Square	F	Sig.
	Regression	4.576	1	4.576	26.655	.000b
	Residual	7.211	42	0.172		
	Total	11.787	43			
	a. Dependent Variable: Organizational Performance					
	b. Predictors: (Constant), Organizational Resources					
Coefficients		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
	(Constant)	1.961	0.423		4.641	0.000
	Organizational Resources	0.528	0.102	0.623	5.163	0.000
	a. Dependent Variable: Organizational Performance					

Source: Author (2019)

A multiple regression analysis was performed to test the joint effect of all the predictor variables on performance of large manufacturing companies in Kenya. The results are presented in Table 4.38. It is evident from the table that the strength of the relationship advanced manufacturing technology, competitive advantage, organizational resources, and performance of large manufacturing companies in Kenya is strong (R=0.701). The results show that the joint effect of advanced manufacturing companies, competitive advantage and organization resources account for 49.2% of variations in performance of large manufacturing companies in Kenya (R^2 = 0.492). The results suggest that organizations that correctly implement advanced manufacturing technologies in their operations, own strategic resources and develop competitive advantage in their industries expect to improve their performance. Further, the results also indicate that 50.8% of performance in large manufacturing companies in Kenya is accounted for by other factors that were not considered in this study.

Table 4.39: Regression Results for the joint Effect of Advanced Manufacturing Technology, Competitive Advantage, Organizational Resources on Performance of Large Manufacturing Companies in Kenya.

Model	**Results**					
Summary	R	R Square	Adjusted R Square	Std. Error of the Estimate		
	.701[a]	0.492	0.454	0.38699		
ANOVA		Sum of Squares	df	Mean Square	F	Sig.
	Regression	5.797	3	1.932	12.903	.000[b]
	Residual	5.99	40	0.15		
	Total	11.787	43			
Coefficients		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
	(Constant)	1.752	0.467		3.752	0.001
	Advanced Manufacturing Technology	0.178	0.079	0.316	2.266	0.029
	Competitive Advantage	0.097	0.152	0.101	0.640	0.526
	Organizational Resources	0.352	0.123	0.415	2.853	0.007
a. Dependent Variable: Organizational Performance						
b. Predictors: (Constant), Organizational Resources, Advanced Manufacturing Technology, Competitive Advantage						

Source: Author (2019)

The ANOVA results in Table 4.38 showing a significant (F= 12.903, p <.005) is a confirmation that regression model attained goodness of fit justifying the use of multiple regression model. Further, using the standardized coefficients, regression results in Table 4.42 show that advanced manufacturing technology statistically predicts the value of performance of large manufacturing companies in Kenya in the presence of competitive advantage and organizational resources at a confidence level of 95% (β = .316, t = 2.266, p< .05). This suggests that one unit of increase in advanced manufacturing technology in the presence of competitive advantage and organizational resources increases performance of large manufacturing companies in Kenya by 0.316 units.

Results in table 4.38 also show that competitive advantage is not statistically significant in predicting the value of performance of large manufacturing companies in Kenya in the presence of advanced manufacturing technology and organizational resources at a confidence level of 95% (β = .101, t = 2.266, p>.05). Further, the results show that organizational resources statistically predict the value of performance of large manufacturing companies in Kenya in the presence of advanced manufacturing technology and competitive at a confidence level of 95% (β = .415, t = 2.266, p< .05). This suggests that one unit of increase in organizational resources in the presence of advanced manufacturing technology and competitive advantage increases performance of large manufacturing companies in Kenya by 0.415 units.

From the regression output in Table 4.38 regression model for the test of hypothesis one can be specified as follows:

$$\mathbf{Y = 1.752 + 0.316\ AMT + 0.101\ CA + 0.415\ OR}$$

These results confirm the hypothesis that the joint effect of advanced manufacturing technology, competitive advantage and organizational resources on performance of large manufacturing companies in Kenya is greater than the effect of each variable on the said performance. Table 4.39 presents a summary of the results on the tests of the hypotheses the study used to investigate the relationship between advanced manufacturing technology, competitive advantage, organizational resources and performance of large manufacturing companies in Kenya.

Table 4.40: Summary of Tests of the Hypotheses and Results

Objective	Hypothesis	Research Findings	Remarks on Study Hypothesis
Objective 1: To establish the effect of Advanced manufacturing technology on performance of large manufacturing companies in Kenya	**H_1:** There is a significant relationship between advanced manufacturing technology and performance of large manufacturing companies in Kenya.	The results indicated that: ⇒ There was a significant relationship between advanced manufacturing technology and performance of large manufacturing companies in Kenya. ⇒ Advanced manufacturing technology has a positive effect on the performance of large manufacturing organizations	**FAILED TO REJECT** hypothesis (**H_1**) arising from the results of the study
Objective 2: To ascertain the role of competitive advantage on the relationship between advanced manufacturing technology and performance of large manufacturing companies in Kenya.	**H_2:** Competitive advantage mediates the relationship between advanced manufacturing technology and performance of large manufacturing companies in Kenya.	The results show that: ⇒ Competitive advantage was significant in the presence of advanced manufacturing technology in the relationship with performance of large manufacturing companies in Kenya ⇒ Advanced manufacturing technology was significant in the presence of competitive advantage in the relationship between advanced manufacturing technology and performance of large manufacturing companies in Kenya	The hypothesis (**H_2**) on full mediation **was REJECTED** arising from the results of the study

Table 4.40: Summary of Tests of the Hypotheses and Results ….Cont.

Objective	Hypothesis	Research Findings	Remarks on Study Hypothesis
Objective 3: To determine the effect of organizational resources on the relationship between advanced manufacturing technology and performance of large manufacturing companies in Kenya	**H_3:** Organizational resources moderate the relationship between advanced manufacturing technology and performances of large manufacturing companies in Kenya.	The results indicated that: ⇒ The interaction term (advanced manufacturing technology*organizational resources) on performance of large manufacturing companies in Kenya was NOT significant in the relationship between advanced manufacturing technology and Performance of large manufacturing companies in Kenya	The hypothesis **(H_3)** was **REJECTED** arising from the results of the study.
Objective 4: To establish the joint effect of advanced manufacturing technology, competitive advantage and, organizational resources on performance of large manufacturing companies in Kenya.	**H_4:** There is a significant combined effect of advanced manufacturing technology, competitive advantage and, organizational resources on performance of large manufacturing companies in Kenya.	The results indicated that there was a significant joint effect of advanced manufacturing technology, competitive advantage, and organizational resources on performance of large manufacturing companies in Kenya.	**Failed to REJECT** hypothesis (**H_4**) arising from the results of the study

Source: Author (2019)

4.5 Discussion of Findings

The study developed four objectives to investigate the relationships between the study variables. The first objective of the study was to establish the effect of advanced manufacturing technology on performance of large manufacturing companies in Kenya. The second objective was to ascertain the role of competitive advantage on the relationship between advanced manufacturing technology and performance of large manufacturing companies in Kenya. The third objective was to determine the role of organizational resources on the relationship between advanced manufacturing technology and performance of large manufacturing companies in Kenya and the fourth objective developed by the study was to establish the joint effect of advanced manufacturing technology, competitive advantage, and organizational resources on performance of large manufacturing companies in Kenya.

Further, the study tested four conceptual hypotheses. The first conceptual hypothesis **(H_1)** tested if there was a significant relationship between advanced manufacturing technology and performance of large manufacturing companies in Kenya. The second hypothesis **(H_2)** tested the mediation effect of competitive advantage on the relationship between advanced manufacturing technology and performance of large manufacturing companies in Kenya. The third hypothesis **(H_3)** was used to test the moderation effect on the same relationship while the fourth hypothesis **(H_4)** was used to establish whether the joint effect of advanced manufacturing technology, competitive advantage and organizational resources was greater than their individual effects on performance of large manufacturing companies in Kenya

To establish the statistical significance in the test of each hypothesis, various forms of regression analysis were used. The discussion of the results was based on four areas that included determining the strength of the relationship between the variables (R), the proportion of the variance for a dependent variable that was explained by an independent variable or variables in a regression model (R^2), the appropriateness of the model used to test the data (F-statistic) and the significance of the regression model at a 95% level of confidence (p-Value). The discussion of the results was also based on what the findings mean in relation to the theoretical foundation adopted by the study, the observed consistency and inconsistencies of the results with previous similar studies and unique findings of the study. The discussion is aligned to the research objectives.

4.5.1 Advanced Manufacturing Technology and Performance of Large Manufacturing Companies in Kenya

The first objective of the study was intended to investigate the effect of advanced manufacturing technology on performance of large manufacturing companies in Kenya. In order to achieve this objective, the hypothesis that there is a significant relationship between advanced manufacturing technology and performance of large manufacturing companies in Kenya was developed and tested. Advanced manufacturing technology was operationalized by design technologies, manufacturing technologies and planning technologies. Financial and non-financial indicators were used to operationalize performance. The following dominant findings of the study are discussed.

First, the results in Table 4.28 revealed a moderately strong positive relationship between advanced manufacturing technology and performance of large manufacturing companies in Kenya ($R=0.565$, $R^2= 0.319$, $\beta=.318$, $t = 4.434$, $F=19.662$, $p< .05$). This implies that change in advanced manufacturing technology influences a change in organizational performance. This finding also suggests that organizations that invest in advanced manufacturing technology and implement it appropriately realize better performance in the industry compared to organizations that fail to embrace advanced manufacturing technology or do not implement it appropriately. Further, the findings indicate that advanced manufacturing technology allows organizations to compete effectively both in the local market and the export or global markets as demonstrated by García-Sánchez, García-Morales and Martín-Rojas (2018), who found in their study that organizations use technology to maintain product positioning and sustain their developed competitive advantage as one way of improving their performance.

Second, the study found that large manufacturing companies use advanced manufacturing technology to a moderate extent in their operations. High investment costs limit utilization of advanced manufacturing technology by large manufacturing companies despite the benefits associated with technology. The findings of the current study are similar with Zahra and George (2002), Tracey, Vonderembse, and Lim (1998) and Ren (2019) who found that large manufacturing companies invest and utilize technology in their operations to a moderate extent due to their high technology capabilities and the resources they own that allows them to respond to the new shift in the manufacturing environment caused by globalization.

The findings in this study on application of advanced manufacturing technology are similar to the findings by Haruna, Gakure and Orwa (2015) in a study in 250 small manufacturing firms in Kaduna, Nigeria. Haruna, *et. al.* (2015) found that advanced manufacturing technology had a significant and positive relationship with performance of small and medium companies as the organizations that applied advanced manufacturing technology in their production process reported better performance compared to those that did not. Further, the finding of this study support the finding by Hasan, Nuri, Turan, and Tolga (2013); Walters (2008); Gunawardana (2006); Sohal and Schroder (1999); Small and Yasin (1997); Sohal (1996) and Swamidass (1995); that organizations improve their performance when they apply advanced manufacturing technology in managing their manufacturing processes. Manufacturing companies observe increased product quality, reduced lead-times, and greater flexibility when they apply advanced manufacturing technology.

The third finding of the study was that large manufacturing organizations in Kenya use planning technologies more than either design technologies or manufacturing technologies in their operations. This finding supports the finding by Nyori and Ogolla (2015) who found that large manufacturing companies had a bias in investing in planning technologies. Management in manufacturing organizations have the responsibility to choose the type of technology to adopt as it must fit the manufacturing process based on the technology acceptance model and innovation diffusion. Further, the chosen technology should have positive characteristics and outcomes to performance such as cognitive usefulness and ease of use, relative superiority and ease of compatibility (Davis, 1986, 1989; Davis, Bagozzi, & Warshaw. 1989; Venkatesh, 2000; Tatnall, 2011 Jones, Lanctot, & Teegen,2001).

The finding in this study also show that manufacturing companies apply both design technologies and manufacturing technologies to a moderate extent in their manufacturing processes while applying planning technologies to a great extent. These results support the findings by José, José, Julio, José, and Jorge, (2019); Yungao Ma and Weixuan (2019); Saberia, and Yusuff, (2011). Finding in this study on application of design technologies and manufacturing technologies are consistent with production methods as product design should incorporate the methods to be used in manufacturing the product to achieve the desired output.

The finding in this study on the application of design technologies and manufacturing technologies also supports the findings by Muogbo (2013) who found that manufacturing organizations apply both design technologies and manufacturing technologies to mitigate manufacturing challenges associated with global competition, develop and achieve competitive advantage to enhance their performance relative to other manufacturing companies. Manufacturing companies apply both product design technologies and manufacturing technologies to optimize their existing manufacturing capabilities and reduce the time production managers need to introduce new tools, jigs and attachments in the production process to manage manufacture of complex products ultimately increasing the overall production efficiency.

The study found that the most applied technology out of the three technology dimensions considered in the study were planning technologies. It was noted from the study that five of the most widely used technologies in the production process were; enterprise resource planning, materials requirement planning, management information systems, total quality management and customer relationship management. The study also found that enterprise resource planning was the most widely used technology by organizations while the application of industrial robots was the least used technology. This supports the finding by Duplaga and Astani (2003) who found that enterprise resource planning is widely used to manage information and organizations by integrating processes, information and employees across all functions allowing organizations to share information on a single database in real- time, compared to any other advanced manufacturing technology.

The study found the application of enterprise resource planning technology was high in response to the new operating environment. Globalization has made manufacturing companies seek better ways to achieve quick customer response, on-time customer order deliveries, optimized inventory levels and, better resource management to improve their performance, which they manage using enterprise resource planning technologies. Application of industrial robot technologies was observed to be low in the study. This supports the finding by Carbonero, Ernst and Weber, (2018) on the application of industrial robots in developing economies.

Fourth, the findings of the study revealed that most organizations had implemented a manufacturing strategy as part of their corporate strategy. Organizations implement a manufacturing strategy with the realization that global trade is based on goods and not services while services depend on manufactured goods. Manufacturing has also been considered as the key to economic growth. This result supports the result by Skinner (1996) who found that organizations develop manufacturing strategies to create a high-quality manufacturing sector to improve their performance. Mass production systems are used by manufacturing companies use traditional production methods to achieve high production efficiency at low total unit production costs. Agile production systems incorporate advanced manufacturing systems in their production systems to enhance these benefits.

Further, manufacturing companies achieve their objectives when they align their manufacturing strategies to their corporate and business level strategies. According to Ward, Leong and Boyer (1994), aligning these strategies allows management to choose appropriate technologies to employ while utilizing the existing employee capabilities to improve organizational performance and also link intelligent networking of machines and processes in their industry with the aid of information and communication technology. This observation explains the exogenous factors that were not part of the study and were found to affect the relationship between advanced manufacturing technology and performance of large manufacturing companies in Kenya which also agrees with the finding by Hayes and Pissano, (1994).

Although the finding of this study revealed a positive relationship between advanced manufacturing technology and performance of large manufacturing companies in Kenya, other studies have observed no improvement in performance attributed to the use of advanced manufacturing technology in the production process. The empirical study by Gichunge (2007) and Dean and Snell (1996) found that advanced manufacturing technology on its own, is not sufficient to enable organizations achieve lower costs of production, better quality, and higher performance. Therefore, the significance of other variables that include the working environment, nature of production processes, organizational goals and, competencies involved in the relationship between advanced manufacturing strategy and organizational performance is also important in determining the expected outcome (Thomson, 1972).

Empirical results of the current study revealed that advanced manufacturing technology accounts for 31.9% of performance in large manufacturing companies in Kenya while 68.1% is explained by other exogenous factors. This finding supports the finding by Raymond (2005), Lei, Hitt, and Goldhar, (1996), Nyori (2015), and Ern, Abdullah, and Yau, (2015) who also found that advanced manufacturing technology on its own does not confer better performance for organizations. The finding from these studies show that although there was a significant positive relationship between advanced manufacturing technology and performance in organizations with regard to increased productivity, cost reductions, flexibility, and quality integration there were still other variables that organizations had to consider to realize the full benefits of using advanced manufacturing technologies. These studies identified organizational structure, organizational culture and the operating environment as some of the factors that affect performance of manufacturing organizations.

The findings of this study contradict the findings by Swamidass and Kotha, (1997) and Gupta (1998). In a study done in 101 companies in the US, Gupta (1998) found no significant relationship between advanced manufacturing technology and organizational performance. They found that other factors within the organization that include; effective implementation of advanced manufacturing technology, organizational culture, organizational capability with requisite core competencies, employee competencies and leadership styles affect the outcomes observed after implementing advanced manufacturing technology. This finding shows that both the contingency theory and the resource-based theory were relevant in this study.

The finding of this study to the effect that other factors also affect performance of large manufacturing companies in Kenya besides advanced manufacturing technology are synonymous with the contingency theory that was used in the study. The contingency theory supports interactions within manufacturing organization operations rather than simple linear relations in determining performance. The finding by Gupta (1998); Udo and Ehi (2009); McDermott and Stock (1999); Hyneck and Janecek (2012); Swamidass and Nair (2004); Swamidas and Kotha (2000); Parthasarthy and Sethi (1992) and Yasin and Michael (1997) that advanced manufacturing technology does not lead automatically to improved financial performance are consistent with this theory, and the finding of the current study, in which no single process or management process can produce the best performance results on its own.

The resource-based view on the other hand perceives organizations as consisting of a bundle of resources that affect the way in which it performs. According to this view, the organizations abilities enable it to add value to the customer value chain, by developing new products, managing costs and product quality by drawing on its resources and capabilities. It has been shown that resources with certain attributes, that are strategic in nature, are the ones capable of making organizations to develop sources of competitive advantage (Madhani, 2010). Findings from the current study show that advanced manufacturing technologies allow organizations to develop and sustain competitive advantage leading to above average returns. Indeed, competitive advantage in manufacturing results from advanced manufacturing technology, which in turn, is driven by external and internal learning (Schroeder, Bates, & Junttila, 2002).

Advanced manufacturing technology allows organizations to model their operations in a unique way and they are different from other resources such as standard equipment and employees with generic skills. Standard equipment that are available in common factor markets are not as effective in achieving high levels of plant performance, since they are freely available to competitors (Bates, & Flynn, 2017). The dimensions of advanced manufacturing technology, design, manufacturing and planning technologies can be used as independent technologies or integrated within the production process. This characteristic of advanced manufacturing technology further allows organizations the freedom and flexibility of choosing which technologies to incorporate in their process, increasing the heterogenous nature of advanced manufacturing technology.

Finally, with regard to the first objective, this study contributes to the growing body of literature on the relationship between advanced manufacturing technology and organizational performance. This study provides a framework for understanding how advanced manufacturing technology may be appropriately viewed as a predictor of organizational performance. The results of this study confirm that advanced manufacturing technology has a positive relationship with performance of large manufacturing companies in a developing economy. Therefore, organizations should expect to increase both their financial and financial performance by investing more in advanced manufacturing technology.

4.5.2 Advanced Manufacturing technology, Competitive Advantage and Performance of Large Manufacturing Companies in Kenya

The second objective was aimed at establishing the role of competitive advantage in the relationship between advanced manufacturing technology and performance of large manufacturing companies in Kenya. In order to address this objective, the study developed and tested the hypothesis that competitive advantage mediates the relationship between advanced manufacturing technology and performance of large manufacturing companies in Kenya. Competitive advantage was operationalized in terms of cost leadership strategies, differentiation strategies, and focus strategies while performance of large manufacturing companies in Kenya was operationalized through financial and non-financial performance indicators.

The study investigated if there was zero order relationship among the variables. The finding was that all the variables in the current study that were used to test this hypothesis on mediation had not been controlled for or "partialed out". This result revealed that a linear relationship existed between the variables and statistical tests on correlation between them could have assumed correlation values ranging between -1 and +1 if significant relationships were confirmed between any of them and a value of 0 if there was no relationship.

Empirical results from the current study show that competitive advantage does not fully mediate the relationship between advanced manufacturing technology and performance of large manufacturing companies in Kenya. Although full mediation was not confirmed in this study, the results of the study confirm that partial mediation by competitive advantage on the relationship between advanced manufacturing technology and performance of large manufacturing companies in Kenya.

This finding is contrary to the finding by Sheridan (1992) on US manufacturing executives who found that competitive advantage fully mediates this relationship. The study by Sheridan (1992) provided evidence that advanced manufacturing technology allowed manufacturing companies to integrate product design and production processes leading to manufacturers developing competitive advantage in their industry. The observed difference in the findings between the current study and Sheridan (1992) may be due to the observed low application of design technologies and manufacturing technologies in the current study.

Empirical finding of the current study is similar to the findings done by Congen (2005) in 399 metal machining firms. The study found that competitive advantage partially mediates the relationship between advanced manufacturing companies and organizational performance. This finding is attributed to organizations developing a strategy-technology fit where the manufacturing technology employed in production processes must be aligned with the desired competitive advantage and the flexibility-efficiency trade-off by advanced manufacturing technologies. Further, in support of this finding on mediation by competitive advantage on the relationship between competitive advantage and performance, there are special requirements that include organizations adopting specific technologies that are combined to support specific competitive requirements (Congen, 2005).

Results from the current study are also similar to the empirical findings on small and micro enterprises by Rangone (1998) who found that competitive advantage partially mediates the relationship between advanced manufacturing technology and organizational performance. The findings in both studies are similar despite the adoption of non-conventional finance models in the study by Rangone (1998) to investigate investments by small-medium firms in advanced manufacturing technology and their impact on performance. Further, the findings are similar although a difference in the study populations between the two studies, as the population in the study by Rangone (1998) were small-medium firms while the current study population were large manufacturing companies.

Despite results from the current study showing that competitive advantage does not fully mediate the relationship between advanced manufacturing technologies and performance of large manufacturing companies in Kenya, the relationship between competitive advantage and performance of large manufacturing companies was found to be significant. Results from the current study show that the relationship between competitive advantage and performance of large manufacturing companies in Kenya is moderately strong and competitive advantage explains 29.2% of the variations in performance of large manufacturing companies in Kenya ($R=0.540$, $R^2=0.292$). Further, the results show that for every unit change of competitive advantage, there is a change of 0.521 units in performance of large manufacturing companies in Kenya. These results show that competitive advantage positively impacts the performance of large manufacturing companies in Kenya.

The results from the current study also revealed that advanced manufacturing technologies are positively related with competitive advantage with advanced manufacturing technology explaining 32.9% of the variations in competitive advantage ($R=0.574$, $R^2=0.329$). The results also show that a unit change in advanced manufacturing technology causes a change of 0.335 units in competitive advantage. These results show that advanced manufacturing technology enables large manufacturing companies in Kenya to develop competitive advantage and therefore attain above average performance. Results also show that large manufacturing companies can use design technologies, manufacturing technologies or planning technologies which were the dimensions of advanced manufacturing technology used in the study, to develop competitive advantage based on either cost leadership or differentiation depending on the manufacturing strategy they intend to implement.

The results from the current study support findings from previous investigations. First, these results support the findings by Stalk and Hout (1990) who found that advanced manufacturing technology helps manufacturing companies to develop competitive advantage in their industry. Advanced manufacturing technology allows manufacturing companies to realize substantial reduction of production cycle times which has immeasurable value in as it determines when the company delivers the desired product or offer required services to their customers. Advanced manufacturing technology also has a positive relationship to productivity, quality, and innovation capability, which lead to improvement in the performance of manufacturing companies as shown by the results from the current study.

Second, the findings of this study are similar to the findings by McKenna (1992) who observed that advanced manufacturing technology enable manufacturing companies to re-engineer their production processes much more easily since they are flexible and as a result gain more dramatic performance. This leads manufacturing companies to develop competitive advantage and become competitive periodically before competitors discover the reason of their competitiveness, especially when their competitive advantage depends on process efficiencies. The finding in the current study also supports findings by swamidas and Kotha (2000) who found that profitable manufacturing companies emphasizing a differentiation strategy approach observe improved performance by employing advanced manufacturing technology in their production process.

Third, the findings of this study are consistent with the results by Adler (1988) who demonstrated that competitive advantage enables a positive relationship between advanced manufacturing technology and performance of manufacturing companies in cost and process leadership. Manufacturing companies determine within the value chain the activities that can enhance performance. These are the activities that ultimately lead them to develop competitive advantage relative to other organizations in the same operating environment. This is especially feasible when manufacturing companies employ advanced manufacturing technology within their production process while implementing differentiation strategies.

Fourth, the results in the current study are similar to the results by Cook (1994) who found that advanced manufacturing technology enabled manufacturing companies to develop competitive advantage in their operations. The empirical results by Cook (1994) show that manufacturing companies use advanced manufacturing technology to deliver customer needs along the manufacturing value chain that incorporates quality, production flexibility and reduction in production costs. Similarly, Schonberger (1986) found that advanced manufacturing technology helped manufacturing companies to create flexibility in their operations.

Fifth, the findings of this study support the findings of Hopp, Antons, Kaminski, & Salge, (2018), Dangayach, Pathak, and Sharma (2006), Oxford Economics (2013), Haruna, Gakure and Orwa (2015), Burcher and Lee (2000) and Rahardjo and Salleh bin Yahya (2010) who found that advanced manufacturing technology helps manufacturing companies to develop competitive advantage in their operations. Manufacturing companies use advanced manufacturing technology after evaluating their internal strengths to match the turbulence in the external environment.

Advanced manufacturing technology is a tool that manufacturing companies use to provide them with a competitive edge and give the required strategic competitive benefit to adequately manage the internal organizational weaknesses. Subsequently, manufacturing companies meet customer needs with regard to product quality, production process flexibility, appropriate product cost and pricing to sustain their performance as competitiveness rests on the transformation speed required to respond to market shifts and technology trends.

4.5.3 Advanced Manufacturing Technology, Organizational Resources and Performance of Large Manufacturing Companies in Kenya

The third objective of the study was intended to establish the effect of organizational resources on the relationship between advanced manufacturing technology and performance of large manufacturing companies in Kenya. In order to fulfil this objective, the study developed and tested the hypothesis that "Organizational resources moderate the relationship between advanced manufacturing technology and performances of large manufacturing companies in Kenya."

Results from the current study show that organizational resources do not moderate the relationship between advanced manufacturing technology and performance of large manufacturing companies in Kenya. The results from the current study support the findings by Tuan and Takahashi (2009) who found in their empirical study in 102 industries in Vietnam that although strategic resources are positively related to performance, different groups of resources support different capabilities and that manufacturing processes that lead to competitive advantage resulting from quality capability have more impact on performance than those which lead to cost reduction capabilities.

Results from the current study also support the finding of Unsal and Cetindamar (2015) who found in an empirical study that technology management is an important source of competitive advantage and it contributes to firm performance in a positive way. Unsal and Cetindamar (2015) observed a strong positive and significant relationship between technology and competitive advantage which also had a strong positive and significant relationship with performance. Unsal and Cetindamar (2015) reckon that resources failed to moderate this relationship as technology is a special type of resource owned by the organization and applied to transform inputs into finished products.

Results from the current study support the empirical findings by Ahmad, Lazim, Shamsuddin, Wahab, and Seman, (2019) in a study involving 302 large and small manufacturing companies in Malaysia. They found a significant and positive relationship between advanced manufacturing technology and performance. Further, Ahmad *et. al* (2019) demonstrated that manufacturing companies observed an increase in performance as a result of increasing technological capability through better quality, cost, flexibility and delivery.

Similarly, results from the current study are consistent and support the findings by Cook and Cook (1994) who found in their empirical study that resources did not moderate the relation between advanced manufacturing technology and performance. Measures of success at achieving competitive advantage through advanced manufacturing technology depend on identifying appropriate strategies that exploit the existing organizational resources. Manufacturing organizations that seek excellence in niche markets globally, employ technology in their production processes to develop and sustain competitive advantages. Likewise, manufacturers that aim to attain world-class standards realize that the need to meet customer needs is paramount in achieving their performance objectives. To consistently meet this requirement, World-class manufacturing systems should be flexible, timely, and responsive.

The results from this study are not consistent with the results of the study by Kotha, Zheng and George, (2011) whose study found that resources moderate the relationship between technology. The results from their study revealed that there is a positive moderation depending on the age of the company. Manufacturing companies are faced with a dilemma when they set up their operations as to when they should invest in technology to balance between straining their constrained resources by investing in technology upfront at start-up or implement a strategy to gradually build –up of technology in their operations. Further, empirical studies by Helfat and Peteraf, (2003); Lavie, (2006), Sapienza et al., (2006), Ahuja and Lampert, (2001) highlight the critical role of timing on capability development by manufacturing companies and choice of entering global markets.

Despite the results for the current study indicating that organizational resources do not moderate the relationship between advanced manufacturing technologies and performance of large manufacturing companies in Kenya, the coefficient of advanced manufacturing technology is observed to increase from 0.318 in the first step to 0.353 in the second step and finally to 0.837 in the third step of the moderation model. This finding reveals that a unit change in advanced manufacturing technology explains 0.837 of variance in performance of large manufacturing companies in Kenya in the presence of organizational resources and the interaction term (AMT*OR) compared to 0.353 without the interaction term.

4.5.4 The Joint Effect of Advanced Manufacturing Technology, Competitive Advantage, Organizational Resources and Performance of Large Manufacturing Companies in Kenya.

The fourth objective of the study was to investigate the joint effect of advanced manufacturing technology, competitive advantage and organizational resources on performance of large manufacturing companies in Kenya. This objective was implemented by the study developing and implementing the hypothesis that there is a significant relationship between the joint effect of advanced manufacturing technology, competitive advantage and organizational resources on performance of large manufacturing companies in Kenya. Arising from literature review empirically identifying that the joint effect of the study variables has a positive synergy on the dependent variable, this hypothesis was modified as "The joint effect of advanced manufacturing technology competitive advantage and organizational resources on performance of large manufacturing companies in Kenya is greater than the effect of each individual predictor on performance of large manufacturing companies in Kenya".

The study developed four regression models to determine the statistical significance of the results from the study in explaining the relationship between and among the study variables and compare their individual and joint effect on performance of large manufacturing companies in Kenya. First, the results in the first regression model show a moderately strong and significant relationship between advanced manufacturing technology and performance of large manufacturing companies in Kenya and that advanced manufacturing technology accounts for 31.9% of variations in performance of large manufacturing companies in Kenya. Further, the results also show that a unit change in advanced manufacturing technology explains 0.318 of variance in performance of large manufacturing companies in Kenya, ($R=0.565$, $R^2= 0.319$, $F=19.662$, $\beta=.318$, $t = 4.434$, $p< .05$).

Second, the results in the second regression model show a moderately strong positive relationship between competitive advantage and performance of large manufacturing companies in Kenya and that competitive advantage accounts for 29.2% of variations in performance of large manufacturing companies in Kenya while 70.8% of performance is accounted for by other extraneous factors. The results also show that a unit change in competitive advantage explains 0.521 of variance in performance of large manufacturing companies in Kenya ($R=0.540$, $R^2= 0.292$, $F=17.286$, $\beta=.521$, $t = 4.151$, $p< .05$).

Third, the results in the third regression model show a strong and statistically significant correlation between organizational resources and performance of large manufacturing companies in Kenya, organizational resources accounts for 38.8% of variations in performance of large manufacturing companies in Kenya, and a unit increase in organizational resources increases performance of large manufacturing companies in Kenya by 0.528 units ($R=0.623$, $R^2= 0.388$, $F=26.655$, $\beta=.528$, $t = 5.163$, $p< .05$).

Fourth, the results from the fourth multiple regression model revealed a strong and statistically significant relationship between advanced manufacturing technology, competitive advantage, organizational resources, and performance of large manufacturing companies in Kenya, the joint effect of these variables account for 49.2% of variations in performance of large manufacturing companies in Kenya, and a unit increase in advanced manufacturing technology in the presence of competitive advantage and organizational resources increases performance of large manufacturing companies in Kenya by 0.316 units ($R=0.701$, $R^2 = 0.492$, $F=12.903$, β (AMT) $= .316$, $t = 2.266$, $p< .05$).

The results also show that a unit increase in organizational resources in the presence of advanced manufacturing technology and competitive advantage increases performance of large manufacturing companies in Kenya by 0.415 units (β (OR) $= .415$, $t = 2.266$, $p< .05$). Further, the results found that competitive advantage was not statistically significant in predicting the value of performance of large manufacturing companies in Kenya in the presence of advanced manufacturing technology and organizational resources at a confidence level of 95% ($\beta = .101$, $t = 2.266$, $p>.05$).

Arising from the findings in the study, the joint effect of the three variables in the study, advanced manufacturing technology, competitive advantage and organizational resources were greater than the individual effects on performance of large manufacturing companies in Kenya. This finding reveals a positive synergy between the three variables to performance of large manufacturing companies in Kenya. This finding supports the finding by Leonidou, Palihawadana, and Theodosiou, (2011) who found that the joint effect of strategy, competitive advantage and organizational resources had a positive impact on performance in a study they conducted on national export programs. The synergy from these three variables allows companies to produce better products with the required customer appeal.

The results of the current study also support the finding by Tracey, Vonderembse and Lim, (1998) who found a positive and significant relationship between the joint effect of advanced manufacturing technology, organizational capabilities, competitive advantage and performance of organizations. Empirical results from the study by Tracey, Vonderembse and Lim, (1998) show that competitive capabilities developed through advanced manufacturing technology and resources owned by manufacturing companies lead to high levels of performance as measured by customer satisfaction and marketing performance. Customer satisfaction provides feedback to manufacturing companies on product quality and price acceptance by consumers.

The findings of the current study are consistent with the results of Abungu, Maingi and Ombara (2016) who found in their study on manufacturing companies in Kenya that the joint effect of advanced manufacturing technology and competitive advantage improved performance of manufacturing companies. Further, they also found that advanced manufacturing technology improved staff retention. Organizations need to retain staff to develop and entrench organizational capabilities, which form part of the intangible organizational resources. Staff retention contributes immensely to skills and organizational memory retention.

The results in the current study support the finding by Nyori and Ogola (2015) who found that advanced manufacturing technology led to development of competitive advantage by manufacturing companies with observed improvement in their performance. Results from this study show that organizations can develop both cost leadership and differentiation competitive advantages when they use advanced manufacturing technology.

Although the joint effect of the study variables is significant and have a strong relationship with performance of large manufacturing companies in Kenya, the effect of competitive advantage in the presence of organizational resources and advanced manufacturing was not significant. Although empirical results from different studies show that advanced manufacturing technology improve performance of manufacturing companies, there is a need to show how organizations achieve competitive advantage when they adopt advanced manufacturing technology in their production process (Rahardjo & Salleh bin Yahya, 2010).

CHAPTER FIVE
SUMMARY CONCLUSION AND RECCOMENDATIONS

5.1 Introduction

The chapter provides a summary of the study, particularly the findings, conclusions and recommendations. Further, implications of the study for theory, policy and practice are discussed, and suggestions made on areas for further investigations. The chapter ends with implications and recommendations. The chapter consists of five sections that provide a summary of the research findings; implications for theory, manufacturing Companies and practitioners; limitations of the study, conclusions of the study and the last section that concludes the final chapter of the thesis presents suggestions for further research.

5.2 Summary

The broad objective of the study was to investigate the role of competitive advantage and organizational resources on the relationship between advanced manufacturing technology and performance of large manufacturing companies in Kenya. The overview of the background was discussed. The theoretical framework used in the study was discussed. The objectives of the study were formulated on the basis of the effect of competitive advantage and organizational resources on the relationship between advanced manufacturing technology and performance of large manufacturing companies in Kenya. The objective on the combined effect of advanced manufacturing technology, competitive advantage and organizational resources on performance of large manufacturing companies in Kenya was also developed and analyzed to determine the synergy between and among the study variables.

The structure of the thesis comprises a brief description of the conceptual, contextual and theoretical foundations of the study. This is followed by statement of the research problem and explication of the conceptual and contextual gaps. The identified gaps capture the un-answered questions in the relationships among the study variables. The research gaps further give rise to research objectives which are linked to hypotheses in chapter three of the study. All the foregoing is presented in chapter one. Chapter two critically reviews pertinent theories and empirical studies and gaps in knowledge identified accordingly. Conceptual framework is developed based on the gaps from the literature review and research objectives. Findings from descriptive data analysis and tests of hypothesis are hereby summarized.

The study used a descriptive survey cross-sectional research design. A self-administered questionnaire was used to collect primary data, while secondary data was collected from the organization's annual financial reports and Capital Markets Authority reports using forms specifically designed for the purpose. Findings on demographic data show that a majority (28.6%) of the respondents held the position of Engineering Manager. This position is important and key to the technical operations associated with advanced manufacturing technology in organizations. The results also show that 25.7% of the respondents held the position of Director Technical Services. This too is an important position in terms of organizational strategy formulation and implementation. The two positions cumulatively represented 54.3% of the respondents in the study.

Results of the study show that 35.6% of the respondents had worked in their organizations for between 4 to 9 years, while cumulatively, 60% of the respondents in the study had worked for the current organization for more than four years while only 8.9% of the respondents had worked in the current organizations for less than 1 year. Further, findings of the current study revealed that 94.6% of the companies had been in operation for a period longer than 3 years. This finding fulfilled one of the requirements of the study which was to include large manufacturing companies in Kenya which had been carrying out manufacturing processes for more than 3 years. The number of years' employees work in an organization helps to determine employee retention abilities of the organization as well as preservation of institutional memory while small and micro companies on average have a lifespan of 3 years (KNBS, 2019).

On the implementation of a manufacturing strategy, results show that 84.44% of the companies in the study had implemented a formal manufacturing strategy within the last six years, while 8.89% of the companies had not implemented a formal manufacturing strategy within this time frame. The results also show a slight difference between organizations that had implemented a manufacturing strategy in the last 6 years (84.44%) and those that had been in operation for more than 6 years (89.4%). This implies that approximately 5.04% of the companies that that have been in operation for more than 6 years did not have a formal strategic plan. Daniel (2014) reiterates the influences of strategic planning, whether formal or informal, and strategic organization on performance. These results show that large manufacturing companies in Kenya employ strategic planning in their operations.

Regarding application of advanced manufacturing technology in the production process, findings of the study revealed that large manufacturing companies in Kenya apply advanced manufacturing technologies in their production processes to a moderate extent. Further, finding show that planning technologies are applied to a great extent while design technologies and manufacturing technologies are applied to a moderate extent by large manufacturing companies in their production process. Arising from this result, large manufacturing companies in Kenya are likely to use planning technologies compared to design technologies and manufacturing technologies in their production process.

Further, managers in manufacturing companies embrace advanced manufacturing technology in the production process of their companies at varying levels. Despite organizations applying both design and manufacturing technologies to a moderate extent, the results show that design technology is used slightly more than the manufacturing technology dimension. On the technology indicators used by large manufacturing companies in Kenya, enterprise resource planning is the most widely used technology while industrial robots are the least used technologies. Five of the most widely used technologies, enterprise resource planning, material resource planning, management information systems, total quality management and customer relationship management are planning technologies while the least used technologies which include industrial robots, automated guided vehicles and automated storage and retrieval systems are manufacturing technologies.

Empirical results of the study had the following results. In regard to the first objective of the study, advanced manufacturing technology was found to be positively and moderately related to performance of large manufacturing companies in Kenya. The results show that manufacturing companies that effectively implement appropriate advanced manufacturing technologies in their production operations achieve better performance compared to those that do not. This finding support the finding by Nyori and Ogolla, (2015), Gunawardana (2006), Kotha and Swamidass (1999) and Hynek and Janecek, (2012). Manufacturing companies employ advanced manufacturing technology for various reasons including managing their inventory, planning their manufacturing operations, addressing both current and future industry needs to meet customer preferences and improving their performance (Jabar, Soosay & Santa, 2010; Saberi, Yussuf, Zulkifli & Ahmad, 2010).

On the second objective of the study, findings revealed that competitive advantage does not fully mediate the relationship between advanced manufacturing technology and performance of large manufacturing companies in Kenya. This finding contradicts the finding by Sheridan (1992) done in the US in companies that applied design technologies in their production process more than large manufacturing companies in Kenya where planning technologies are applied more. Further, the results of this study also contradict the results by Congen (2005) who conducted a study in small manufacturing firms. Arising from the finding of the current study, it is concluded that advanced manufacturing technology directly impacts performance of large manufacturing companies in Kenya. Further, the finding from the current study shows that advanced manufacturing technology enables large manufacturing companies in Kenya to develop competitive advantage in their respective industries and achieve improved performance compared to companies that do not.

The third objective of the study was to establish the role of organizational resources on the relationship between advanced manufacturing technology and performance of large manufacturing companies in Kenya. Empirical results emanating from a stepwise regression analysis revealed that organizational resources do not moderate this relationship. Emanating from this finding, the study concludes that organizational resources do not alter the relationship between advanced manufacturing technology and performance of large manufacturing companies in Kenya. The study considered organizational resources to include assets, physical facilities and employee capabilities. This finding shows that once organizations have effectively implemented advanced manufacturing technology in their production processes, they achieve better performance in their operations irrespective of the assets, physical facilities and employee capabilities in their organizations.

The last objective was intended to establish whether the joint effect of advanced manufacturing technology, competitive advantage and organizational resources was greater than their individual effects on performance of large manufacturing companies in Kenya. The finding of the result revealed that the joint effect was greater than the individual effects of the variables. This finding reveals that advanced manufacturing technology, competitive advantage and organizational resources together form a super-additive synergy where the whole is greater than the sum of parts (Eye, Schuster, Rogers, 1998).

5.3 Conclusion

This section presents the conclusion of the study. The conclusions emanate from the results of the tests of the four hypotheses. The objectives and hypotheses of the study were developed from the theoretical and empirical literature review. The hypotheses in the study were confirmed or failed to be confirmed based on the statistical significance of the various statistical tests. Conclusions of this study are drawn from the findings in relation to the corresponding research objectives.

5.3.1 Advanced Manufacturing Technology and Performance of Large Manufacturing Companies in Kenya

The first objective of the study was to establish the effect of advanced manufacturing technology on performance of large manufacturing companies in Kenya. The findings of the current study reveal that there is a moderately strong positive and significant relationship between advanced manufacturing technology and performance of large manufacturing companies in Kenya. Arising from this finding, the study concludes that organizations that invest in advanced manufacturing technology and implement it appropriately realize better performance in the industry compared to organizations that fail to embrace it or do not implement it appropriately.

Results from the current study reveal that advanced manufacturing technology allows large manufacturing companies in Kenya to develop competitive advantage through applying design technologies, manufacturing technologies and planning technologies in their production processes. Further, the findings show that application of planning technologies in the production processes is more than either design technologies or manufacturing technologies. The study concludes that manufacturing companies in developing economies that employ planning technologies experience better product manufacturing scheduling than those that do not and also realize improved performance. Production planning helps manufacturing companies to know the market demand and how it can be satisfied. This makes the companies to achieve reduced labor costs by improving production cycle times, improving process flow, reducing inventory costs by decreasing the need for safety stocks and excessive work-in-process inventories, optimizing equipment usage, increasing production capacity and improving on-time deliveries of products and services.

5.3.2 Advanced Manufacturing Technology, Competitive Advantage and Performance of Large Manufacturing Companies in Kenya

The second objective of the study sought to ascertain the role of competitive advantage in the relationship between advanced manufacturing technology and performance of large manufacturing companies in Kenya. The study used path analysis proposed by Baron and Kenny (1986). The findings of the study show that competitive advantage does not mediate this relationship leading the study to conclude that advanced manufacturing technology directly impacts performance of large manufacturing companies in Kenya.

Although results from the study revealed that competitive advantage does not fully mediate the relationship between advanced manufacturing technology and performance of large manufacturing companies in Kenya, the relationship between advanced manufacturing technology and competitive advantage was found to be positive and moderately strong. Arising from this observation, the study concludes that large manufacturing companies develop competitive advantage in their operating industries when they adopt and effectively implement advanced manufacturing technology in their operations, allowing them to manufacture products that meet market requirements.

5.3.3 Advanced Manufacturing Technology, Organizational Resources and Performance of Large Manufacturing Companies in Kenya

The study investigated the effect of organizational resources on the relationship between advanced manufacturing technology and performance of large manufacturing companies in Kenya as the third objective. The researcher developed the third hypothesis to test this relationship using organizational resources as a moderator. The results of the study show that organizational resources do not moderate this relationship.

Arising from this finding, the study concludes that large manufacturing companies in Kenya realize benefits associated with correctly implementing advanced manufacturing technology irrespective of the resources they own. The study also concludes that advanced manufacturing technology allows large manufacturing companies to change the way resources are produced and applied in transforming consumer behavior. This enables large manufacturing companies to develop competitive advantage and improve their performance.

5.3.4 The Joint effect of Advanced Manufacturing Technology, Competitive Advantage, and Organizational Resources on Performance of Large Manufacturing Companies in Kenya

The fourth objective aimed at establishing the joint effect of advanced manufacturing technology, competitive advantage, and organizational resources on performance of large manufacturing companies in Kenya. When variables were combined, they were expected to produce positive synergy and have a bigger impact on performance compared to their individual effects. Results show that, advanced manufacturing technology, organizational resources and competitive advantage jointly have a significant effect on performance of large manufacturing companies in Kenya. The joint effect was found to be greater than the individual effect of the variables on performance.

Arising from the finding of the joint effect of the study variables, the researcher concluded that the concept of synergy was confirmed and concludes that large manufacturing companies achieve better performance when they adopt advanced manufacturing technologies which helps them to enhance their competitive advantage and also change the way resources are produced and applied in managing consumer purchase behavior.

Finally, the results confirmed that; advanced manufacturing technology is positively related to performance of large manufacturing companies in Kenya, competitive advantage does not have a mediating role on the relationship between advanced manufacturing technology and performance of large manufacturing companies in Kenya, organizational resources do not moderate this relationship and the joint effect of advanced manufacturing technology, competitive advantage and organizational resources was greater than their individual effect on performance of large manufacturing companies in Kenya.

The findings provide empirical evidence to support theoretical understanding of the resource-based view and contingency theory of strategy. The study also revealed that competitive advantage does not mediate the relationship between advanced manufacturing technology and performance of large manufacturing companies in Kenya. Further, organizational resources do not moderate this relationship. The study concludes that manufacturing companies that correctly implement advanced manufacturing technology perform better than those that fail to embrace it.

5.4 Implications of Research Findings

The current study examined the relationship between advanced manufacturing technology, competitive advantage, organizational resources and performance of large manufacturing companies in Kenya. The study also examined the mediating role of competitive advantage and the moderating role of organizational resources on this relationship. Results of this study have contributed to theory, practice, and knowledge in the field of management generally and strategic management in particular as presented below:

5.4.1 Theoretical Implications

First, the current study adds to both the growing conceptual and empirical investigations on the relationship between advanced manufacturing technology and performance. This study revealed that organizations that implement advanced manufacturing technology in their production process achieve better performance compared to those which fail to embrace technology. The study revealed that large manufacturing companies in developing economies apply planning technologies more than design technologies or manufacturing technologies in their operations.

Manufacturing companies in developing economies use planning technologies in their production process to effectively forecast market demand. Planning technologies help manufacturing companies to meet customer needs, reduce their labor costs by reducing the production cycle time, improve process flow, reduce inventory costs by decreasing the need for safety stocks and excessive work-in-process inventories, optimize equipment usage, increase capacity and achieve improved on-time deliveries of products and services. This adds to the body of knowledge to the effect that advanced manufacturing technology influences performance of manufacturing companies in developing economies.

Second, research in advanced manufacturing technology has been concentrated more on its adoption by small and medium enterprises. This study investigated its application and impact on performance of large manufacturing companies in a developing economy. Findings of the study confirm the impact of technology on performance in large manufacturing companies in developing economies is similar to that in small and medium companies implying that company size does not affect the expected outcomes when applying technology.

Third, the findings of the current study show that advanced manufacturing technology explains 31.9% of variations in performance of large manufacturing companies in Kenya. This implies that there are other exogenous factors that explain the other 68.1% of variations in performance. Therefore, manufacturing companies have to determine and manage these factors to further improve their performance as they apply advanced manufacturing technology in their production process. Further, various dimensions of advanced manufacturing technology have been used to relate performance to the dimensions (Darban, Wan Ismail, 2012). The current study employed three dimensions of advanced manufacturing technology that included design technologies, manufacturing technologies and planning technologies, that allowed the researcher to compare the effects of each dimension on performance. This provided an alternative method of investigating the effect of advanced manufacturing technology on performance.

Fourth, the study found that competitive advantage does not fully mediate the relationship between advanced manufacturing technology and performance of large manufacturing companies in Kenya, but that advanced manufacturing technology allows organizations to develop competitive advantage in their operating environment. Manufacturing companies rely on competitive advantage to effectively compete, especially in the global market as protectionist barriers crumble in emerging markets around the world. The arrival of multinational companies in developing economies to exploit new opportunities for growth is a boon to local consumers, who benefit from the wider choices now available. Local manufacturing companies have to develop new methods to compete against the multinationals who wield substantial financial resources, superior products, powerful brands, and seasoned marketing and management skills (Dawar & Frost, 1999). Manufacturing companies in developing economies can use advanced manufacturing technology to effectively compete in protecting their local markets.

Fifth, the findings show that organizational resources do not moderate the relationship between advanced manufacturing technology and performance of large manufacturing companies in Kenya. There exists a gap between the costs on research and development compared to the value of resources owned by manufacturing companies and the expected outcomes from investing in expensive technology is important in managing global competition.

The finding from the current study show that technology assists managers in manufacturing companies to close this gap without relying only on the resources they own. Further, finding of the current study show that managers can also consider other factors including their inescapably dual role, the variety of internal markets to be served, legitimate resistance to change, the right degree of promotion, the choice of implementation site, and the need for one person to take overall responsibility besides resources they own to improve the performance of their companies after implementing advanced manufacturing technology in their production process (Leonard-Barton & Kraus, 1985).

The current study has made contribution to the resource-based theory which posits that organizations perform better when they own strategic resources (Barney, 1991). Resources owned by manufacturing companies include all assets, capabilities, organizational processes, firm attributes, information, knowledge that they control directly and which they use to develop and implement both organizational strategies and manufacturing strategies to improve their efficiency and effectiveness (Daft, 1983). Further, Barnes (1991) identifies physical capital resources to include the technology used in a firm, a firm's plant and equipment, its geographic location, and its access to raw materials. The current study concluded that manufacturing companies that apply advanced manufacturing technology perform better than those that do not embrace technology in their operations, consequently adding to the body of knowledge on the resource-based theory.

The current study has also made contribution to the contingency theory which posits that there is no one perfect way that manufacturing companies can be managed to deliver the best performance. Findings of this study show that advanced manufacturing technology on its own does not fully enable large manufacturing companies to meet increased requirements for competitiveness, innovation, quality, flexibility and information processing capability. In order for large manufacturing companies to fully achieve the required performance, findings in the study reveal that effects of other factors on performance need to be considered as advanced manufacturing technology explains only 31.9% of performance. This finding confirms the contingency theory in that other factors including; the implementation process of advanced manufacturing technology, organizational culture, leadership, external environment and internal environment factors including employee skills also impact performance besides just adopting advanced manufacturing technology (Raymond, 2005).

5.4.2 Implication for Practice

The finding of the current study that advanced manufacturing technology has a positive significant relationship on performance of large manufacturing companies in Kenya has implications on operations in manufacturing companies. Manufacturing has been described as a complex production process that involves transforming raw materials into finished products that meet the quality and other specifications like reliability, durability and performance at the best price to meet customer needs. Manufacturing depends on many other industries to supply the required raw materials and to distribute the finished products. Due to competitiveness observed in the manufacturing industry, companies can use advanced manufacturing technology to obtain better performance and meet customer needs.

The study also revealed that there was a significant relationship between the two variables, advanced manufacturing technology and organizational performance in manufacturing companies. Using this finding, managers in manufacturing companies can use advanced manufacturing technology to enhance organizational performance through better organizational design and improve stakeholder engagement in meeting their needs. The stakeholders include; a) creditors, who would benefit from the improved performance b) directors of the company find it easy to manage the companies c) employees are motivated by the working environment, d) government (and its agencies) gain more taxes from the operations of the companies, e) owners (shareholders) of the company would realize above average returns to their investments.

Findings of the current study show a positive relationship between advanced manufacturing technology and organizational performance. The finding also show that advanced manufacturing technology allows manufacturing companies to develop competitive advantage in their industry. Therefore, industry practitioners can use this finding to develop competitive advantage which is an important factor in market and product development. This increases organizational performance and enables local companies to effectively compete with multinational companies arising from competition brought about by globalization and collapse of protectionism by Governments. Further, this encourages investment in the manufacturing sector that helps developing economies to provide employment opportunities (Boyer et al., 2017).

Second, the finding in this study helps Directors and Managers to carefully appraise investments in their companies. The finding from the current study show that advanced manufacturing technology accounts for 31.9% of organizational performance while the remaining 68.1% is accounted for by other variables. Hence, advanced manufacturing technology on its own does not lead to great improvement in organizational performance. Organizations should find a fit between advanced manufacturing technology dimension and the desired organizational operating strategy incorporating other variables to achieve great improvement in organizational performance. Swamidass and Kotha (2000) and Saberi *et al.* (2010) proposed and grouped the variables in 3 categories including; technological, organizational and internal/external variables.

Third, results from the current study show that design technologies and manufacturing technologies are used to a moderate extent by manufacturing companies in Kenya. Further, 28.9% of the companies in the study are multinational companies with operations in all the continents. The low utilisation of design technologies compared to planning technologies as observed in the study implies that multinational companies carry out research and development activities in developed countries which have better resource endowment and exporting the new product and service innovations to Kenya for production. This finding informs Company Executives to liaise with their parent companies in developed economies to increase the use of design technologies in developing economies to benefit fully from local inventions that effectively meet the needs of the local customers.

Fourth, the results of the current study show that when technology is incorporated in the production process, it aids organizations to improve their performance. Organizations realize the full benefits from investing in technology when they use appropriate skilled labor having adequate capabilities to correctly manage the technology. Therefore, findings of the current study guides managers to realize that when organizations invest in new technologies within their production process, they also need to carry out a training needs assessment and plan on how to develop and improve employee skills in line with the new technology. Well trained employees build individual and subsequently team capabilities that can be utilized to achieve the full potential of advanced manufacturing technology. This study assumed that all the employees had the requisite skills and knowledge to effectively use all the technology associated with design, manufacturing and planning within the production process.

5.4.3 Contribution to Knowledge

A conceptual model was developed to investigate the following variables; advanced manufacturing technology, competitive advantage, organizational resources and organizational performance. The ensuing hypotheses from the model were tested empirically to determine mediation by competitive advantage and moderation by organizational resources on the relationship between advanced manufacturing technology and organizational performance. The model used both financial and non-financial performance indicators to determine organizational performance. This contributes to addressing the knowledge gaps on organizational performance.

Further, the study linked advanced manufacturing technology, competitive advantage and organizational resources providing the basis to determine their individual effect on organizational performance. Results of the study demonstrated that all the three variables used in the study, advanced manufacturing technology, competitive advantage and organizational resources had varying positive and significant effects on performance. The effect on performance due to organizational resources was more than the effect observed from either advanced manufacturing technology or competitive advantage. Performance is a key deliverable for Managers of manufacturing companies. The finding of this study allows managers in manufacturing companies of all sizes and different economies to use advanced manufacturing technology and organizational resources to develop and sustain competitive advantage in their manufacturing processes.

Findings of the current study show a positive and significant relationship between different taxonomies of advanced manufacturing technology and non-financial organizational performance. Non-financial organizational performance includes; speed of product to market, employee motivation, customer responsiveness, product quality, and employee retention among others. The non-financial benefits associated with advanced manufacturing technology may be used to increase the motivation of employees. Managers in manufacturing companies can adopt and implement different taxonomies of advanced manufacturing technology to benefit from the positive performance outcomes and also reduce the hiring and training cost associated with new employees. This finding allows Directors and Managers flexibility when determining the type of technology to adopt and integrate within their production process.

The study identified that organizations use different technologies at different levels within their production process. Among the technologies used in the study, planning technologies were used more than any other technology whereas the use of robots was low. The results of the study identify the existing opportunity for companies to exploit by increasing the use of robots in their production process. This further helps manufacturing companies to develop and sustain competitive advantage by integrating the use of robots in their manufacturing process to further enhance efficiency, reliability, product consistency, and reduce production costs to meet customer needs. The expected high returns associated with using robots in the manufacturing process justifies the initial high investments costs of adopting the use of robots. This finding further contributes to addressing the knowledge gaps on existing opportunities for improving manufacturing firm performance.

Results of the study show that competitive advantage had a partial mediation between advanced manufacturing technology and performance of large manufacturing companies in Kenya. Specifically, the study found that organizations implemented both the cost leadership and differentiation strategies moderately. The flexibility associated with advanced manufacturing technology allows organizations to implement either differentiation or cost leadership strategies or both of the strategies at the same time within the same manufacturing process without worrying about being stuck in the middle according to Potter (1990) as both strategies require different operating conditions when traditional production methods are used. This finding of the study encourages more research.

The results of the study show that organizations using advanced manufacturing technology develop and sustain competitive advantage in their production process. Organizations achieve this favorable operating condition by; managing their operation costs, improving product quality, and reducing their product delivery costs. These operational activities have a remarkable positive effect on the way organizations achieve profits by exercising optimal production associated with efficient transformation of raw materials into finished products. Cost control is at times detrimental to the operations of an organization when it is implemented in an appropriate way despite being derived from production efficiencies associated with advanced manufacturing technology through better utility of production material, labor, and financial resources. The current study adds knowledge to managing operations in manufacturing organizations.

The resource-based view of strategy emphasizes on resources as the source of competitive advantage as long as they have four characteristics of being rare, having value, not easy to imitate and hard to substitute. Results of the current study show that organizational resources have a more significant impact on the performance of organizations compared to advanced manufacturing technology and competitive advantage. The result therefore contributes to increased understanding of the resource-based view of strategy as postulated by Barney (1991) and Wernerfelt (1989).

The research also serves as a reference point for studying the relationship between advanced manufacturing technology, competitive advantage, organizational resources and performance. The research tested competitive advantage as a mediating variable in this relationship. The mediation effect on the relationship was not fully confirmed by the results of the study. This result implied that competitive advantage partially mediates the relationship although there was a strong positive effect due to competitive advantage on each of the variables. This encourages more research to confirm other linkages between these variables leading to addition to the body of knowledge.

Further, the research also tested organizational resources as a moderating variable on the relationship between these variables. The moderation effect on this relationship was not confirmed despite organizational resources having a significant effect on performance. These results show that organizational resources have no effect on the strength of the relationship between these variables. In arriving at this result, advanced manufacturing technology has the ability to improve performance of any organization irrespective of its size. This encourages more research leading to addition to the body of knowledge.

Other studies conducted in different contexts and using different methodologies in analysing the results, have been used to determine the exact relationship between the variables used in the study. Therefore, this study continues to add to the body of knowledge in pursuit of better organizational performance. Previous studies focused on examining one or two variables, or different context of advanced manufacturing technology and performance. The study, therefore, contributes to increased understanding that combining different variables may result in more complex capacities which are harder to be imitated by competitors.

5.5 Limitations of the Study

There were limitations in this study that present an opportunity for other researchers to continue investigating the relationships between variables in this study. First, is the assumption that the manufacturing companies in the survey were at the same level of implementation of advanced manufacturing technology in their operations. The study considered 55 manufacturing companies which might be at different levels of adoption and implementation of advanced manufacturing technology. Hence, generalizing the results could be limited and can be misleading. Future investigations should consider organizations at similar levels of adoption and implementation of advanced manufacturing technology.

The study used a cross sectional descriptive research design which captures the attributes of variables under research at a point in time. Although cross-sectional descriptive research designs have advantages such as; relatively easy and quick to conduct, low data collection costs, ability to measure all the attributes of variables under investigation and are good for descriptive analysis and generating hypotheses, they have disadvantages which include limitation on timeline-based research, difficult to have a homogenous sample, and they have a possibility of having a bias. The study was therefore limited to using performance from the manufacturing company's data collected at one point in time which may not be representative of the actual performance of the company. A longitudinal design, would enable the researcher to compare the performance over a period of time.

The study used the number of employees in the company to determine the population of the study. This criteria of identifying the population to be included in the study led to data collection from companies with more than 100 employees which were considered to be large manufacturing companies. In effect, the assumption was that all companies with more than 100 employees have the same characteristics, which may not be true as it is evident that management complexities in an organization increase with the size and number of employees. This is a limitation on the requirement of homogeneity required for cross-sectional research designs and could have negative impacts on the results from the study. Further, the respondents to the study instrument were limited to one individual from each company. The selection of one respondent is yet another limitation of the study as the selected respondent may lack objectivity when responding to the data collection instrument.

Organization culture takes a long time to evolve and organizations develop unique identities using their organizational culture. Organizational culture also has an impact on organizational performance depending on employee skills, exhibited knowledge on process factors, and problem-solving ability (Motilewa, Agboola, Adeniji, 2015). The underlying characteristic in an organization includes the values and beliefs that are generally in play within the organization. Organizational culture may allow companies to manipulate organizational performance leading to misleading information on performance being disseminated to the public. These are factors that ultimately add and lead to impacting performance in an organization. This study did not include organizational culture as a variable in determining organizational performance.

A more complex statistical model to test the relationships between and among the four variables in the current study would help researchers have a better interpretation of the results and lead to a better understanding of these relationships compared to the simple and multiple regression analysis that was used to test the relationship between and among the study variables. The study used financial data for a period of three years in analysing the financial performance of the organizations. Three years may not be a sufficient period to determine the financial performance of an organization and may not provide sufficient data for analysis and inference. This is a limitation towards developing and analysing the financial performance of the organizations in the study.

5.6 Directions for Future Research

The quality of collected data in a study determines the veracity of the results, conclusions and the resultant inference from the study. Researchers find it easier to collect less structured data during a research study which in itself has been found to be very productive though fraught with many challenges (Holden, McDougald Scott, Hoonakker, Hundt, & Carayon, 2015). The study used structured data that was collected from one individual in each of the organizations in the study population. There may be a bias in the data collected by relying on only one individual as there might be lack of objectivity while responding to the study instrument used to collect data. Some of the data was also not cross cutting in the organization but specific to particular departments and may have required the input of other Managers within the organization. Future researchers should involve more people in management hierarchy.

The study involved four variables namely advanced manufacturing technology, competitive advantage, organizational resources and performance of large manufacturing companies in Kenya. The data involved in this study is complex since it is large and is collected from many disparate sources. The study posed a challenge in determining the amount of data to collect and statistical models to use for analyzing the resultant data. Although the study relied on descriptive, simple linear and multiple regression models of statistics, future researchers should consider developing and incorporating more statistical models.

The study investigated the mediating effect of competitive advantage on the relationship between advanced manufacturing technology and performance of large manufacturing companies in Kenya. The investigation failed to fully confirm this relationship. Future research should consider investigating further full mediation of competitive advantage on the two variables, advanced manufacturing technology and organizational performance by focusing on, cost leadership, differentiation and focus strategies as espoused by Potter (1986). The mechanism through which competitive advantage enhances organizational performance after adoption of advanced manufacturing technology in the production process appears to be more complex than initially was conceived.

The study investigated the moderating effect of organizational resources on the relationship between advanced manufacturing technology and performance of large manufacturing companies in Kenya. The investigation failed to confirm the existence of this aspect of organizational resources between the two variables and therefore resources do not affect the strength of the relationship either positively or negatively. It had been expected that organizational resources would either amplify or weaken the relationship between these two variables from the resource-based view of strategy. Future research should consider investigating further the moderation effect of organizational resources on this relationship.

The study confirmed the use of advanced manufacturing technology as a manufacturing strategy used by organizations to improve their performance. Further, the study also confirmed that organizations use different technologies at different levels within their production process. Future researchers should investigate the different roles of these technologies towards performance to establish the optimal mix on the adoption of these technologies.

Finally, the study used cross-sectional data and the cross-sectional approach applied did not allow making observations for comparison at a later point in time as would have been the case if a longitudinal study approach had been used. If the investigation had used a longitudinal study it could have been possible to further explore whether the interaction effect of advanced manufacturing technology and manufacturing companies' performance would become important if all the companies were at the same level of adoption. Part of the observed differences on performance in different companies in the study may be caused by the difference existing due to the different strategic implementation stage. Many authors have recommended longitudinal studies, to allow researchers to have a comparison on the data at different points in time, although these studies are normally more expensive, they add value to the research (Yoon, 2008; Adam & Swamidass, 2009; Snell and Dean, 2002). to provide valuable insights on advanced manufacturing technology investment in a dynamic world.

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Appendices

Appendix I: Research Questionnaire

The questionnaire is designed to collect data from large manufacturing companies in Kenya to be used in evaluating advanced manufacturing technology, competitive advantage, organizational resources and performance of large manufacturing companies in Kenya. All information in this questionnaire will remain absolutely confidential and will be seen only by academic researchers involved in this study. The data shall be for academic purposes only and will be treated with strict confidence. Your co-operation in facilitating the study is highly appreciated.

Part I: Respondent's and Organizational Information

Name of Organization……

Please state your position/title ……

I. Number of years you have worked with the organization (Tick (√) as appropriate)

Less than 1 Year	[ ]	Between 1- 3 Years	[ ]	Between 4 – 9 Years	[ ]
Between 10 -15 Years	[ ]	Between 16-19 Years	[ ]	Over 20 Years	[ ]

II. What is the market coverage of your organization? (Tick (√) as appropriate)

National	[ ]	Regional (within East Africa)	[ ]
Continental (Within Africa)	[ ]	International (Africa and Beyond)	[ ]

III. What is the number of years the organization has been in operation? (Tick (√) as appropriate)

Less than 1 year	[ ]	Between 1 – 3 Years	[ ]		
Between 4 – 6 Years	[ ]	Between 7 – 10 Years	[ ]	Over 10 Years	[ ]

IV. Number of permanent employees in the organization? (Tick (√) as appropriate)

Less than 50 [ ] Between 50-100 [ ] Between 101-200 [ ]
Over 200 [ ]

V. Has your Organization implemented any manufacturing strategy in the last 6 years? (Tick (√) as appropriate)

YES [ ] NO [ ]

Part II: Advanced Manufacturing Strategy

Indicate the extent to which the following statements express the use of advanced manufacturing technology and its impact on performance in your organization:

1=Not at all: 2=Small extent: 3=Moderate extent: 4=Great extent: 5=Very great extent

	Design Technologies in the Organization The organization uses the following technologies in designing products:	1	2	3	4	5
1	Computer aided design (CAD)					
2	Computer aided Engineering (CAE)					
3	Computer aided process planning (CAPP)					
4	Group technology (GT)					
	Manufacturing Technologies in the Organization The organization uses the following technologies in production:					
1	Computer aided manufacturing (CAM)					
2	Computer integrated manufacturing (CIM)					
3	Computer numerically controlled machines (CNC)					
4	Numerically controlled machines (NC)					
5	Flexible manufacturing systems (FMS)					
6	Computer aided inspection (CAI)					
7	Industrial robots					
8	Automated guided vehicles (AGV)					
9	Automated storage and retrieval systems (AS/RS)					
10	Programme logic controllers (PLC)					
	Planning Technologies The organization has implemented the following technologies and utilizes them in planning					
1	Materials requirement planning (MRP)					
2	Manufacturing resource planning (MRPII)					
3	Computer preventive maintenance planning (CPM)					
4	Just in time (JIT)					
5	Management information systems (MIS)					
6	Enterprise resource planning (ERP)					
7	Total quality management (TQM)					
8	Customer relationship management (CRM)					

Part III: Competitive Advantage

Indicate the level to which the you agree with the following statements on how advanced manufacturing technology relates to your firm's competitive environment and performance.

1= Strongly Disagree: 2= Moderately Disagree: 3= Neutral: 4= Moderately Agree:
5= Strongly Agree

	Cost Leadership Our organization exhibits the following characteristics:	1	2	3	4	5
1	High Process engineering skills among employees					
2	Our products are designed for ease of manufacture					
3	The organization has sustained access to inexpensive capital					
4	Management exercises close supervision of labour					
5	Management always has tight production cost control					
6	Employees are given incentives based on quantitative targets.					
7	Management always ensure that all the costs are kept at the minimum possible level.					
Differentiation Our organization practices the following:						
1	The organization offers customer service for all purchases of our Products					
2	Our products are unique					
3	The organization has cultivated a reputable brand image in the Industry					
4	The organization employs the most current technology in production					
5	The organization uses dealers/agents to distribute its products					
6	Our customers are loyal to our products					
Focus Our Organization,						
1	Focuses on a small niche market					
2	Manufactures products that are aimed at a small target market					

Part IV: Organizational Resources

Indicate the extent to which these statements represent the effect of advanced manufacturing technology on resource position and performance in your organization

1=Not at all; 2=Small extent: 3=Moderate extent: 4=Great extent: 5=Very great extent

Assets		1	2	3	4	5
A	The leaders effectively pool resources and expertise toward a shared goal.					
B	The leadership regularly access inventory of the organization					
C	The organizational has developed a reputable brand name in the Industry					
D	The organization has patented its products					
E	The organization has an effective product distribution network					
F	The organization has strategic partnership contracts with other global manufactures					
G	The organization is located in a prime area in relation to the Customers					
H	The organization has its own registered trade marks					
Physical Facilities						
A	The organization has sufficient office and production space					
B	The organization owns land for expansion of its facilities					
C	The organization has a replacement strategy for its production Equipment					
Employee Capabilities						
A	The organization has an overall approach to human resource Development					
B	Human resource development programs are tied to the industry technological needs					
C	The organization has a training and development policy that support use of technology in production					
D	The organization practices an effective performance management system					
E	The organization encourages employee own skills development					
F	The organization embraces coaching at the workplace					

Part V: Organizational Performance

a) Financial Performance

Fill in the table below the information required:

	2013	2014	2015	2015	2016	2017
Gross revenue (Ksh. '000)						
Gross profit (Ksh.'000)						
Net profit (Ksh. '000)						
Market share (%)						

b) Non-Financial Performance

Use the keys provided to Tick (√) as appropriate: 1= Strongly Disagree: 2= Moderately Disagree: 3= Neutral: 4= Moderately Agree: 5= Strongly Agree on how advanced manufacturing technology impacts non-financial performance in your organization

Customer satisfaction		1	2	3	4	5
A	Our customers rate how our organization responds to their concerns highly					
B	Customers rate our organization highly with regard to dealing with them professionally					
C	Our technical support meets the desired competence levels expected by our customers					
D	Products from our organization are rated highly by our customers					
E	Products from our organization meet the needs and expectations regarding quality and performance of our customers					
F	Our organization always meets the timelines on delivery required by our customers					
G	Our customers always find our products to be competitive and represent best value for total cost of lifetime ownership					
Employee Retention						
A	Employees are always happy to work in our organization					
B	Our employees always recommend our organization to prospective employees					
C	The organization clearly conveys its mission to its employees.					
D	Employees understand how their jobs aligns with the organizations mission.					
E	There is good communication from managers to employees in the organization.					
F	Employees in the organization have the tools and resources they need to do my job.					
G	Employees in the organization receive the right amount of recognition for their work.					

Thank you for having completed filling the questionnaire.

All the information provided will be treated with high confidentiality.

Should you require to get the results of the study kindly indicate the appropriate contact in the space provided, or contact:

The Ph. D Co-Ordinator,

School of Business,

University of Nairobi,

P.O. Box 30197, 00100,

Nairobi.

E-mail: dsp@mail.uonbi.ac.ke.

Name: …….....

Contact information

……

……

……

……

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Appendix II: Letter of Introduction

LETTER OF INTRODUCTION

RE: RESEARCH STUDY

I am a student carrying out my Ph.D. thesis at the University of Nairobi on advanced manufacturing technology, competitive advantage, resources and business processes, competencies and, performance in large manufacturing companies in Kenya, focussing on the manufacturing industry in Kenya. The key objective of the study is to contribute to the intellectual field of management in Kenya and globally on advanced manufacturing technology strategy and performance.

Please respond to the questionnaire items as completely as probable. All the data gathered in this study will be treated with absolute confidentiality and the questionnaire will not take you more than 30 minutes to complete. Should you require to get the results of the study kindly indicate the appropriate contact in the space provided, or contact myself on the address given below or the Ph.D Co-Ordinator School of Business, University of Nairobi, P.O. Box 30197, 00100, Nairobi. E-Mail, dsp@mail.uonbi.ac.ke.

I thank you in advance and look forward to your feedback. Your co-operation will be highly appreciated.

Yours Sincerely,

Eng. Musebe Edward Achieng

Appendix III: Manufacturing Companies in Kenya that are members of the Kenya Association of Manufacturers with more than 100 employees and have implemented Design Technologies, Manufacturing Technologies and Planning Technologies in their production Process.

	Company	Main Product Manufactured	Location (County)
1	Butali Sugar Mills Ltd	Sugar	Kakamega
2	Cadbury Kenya Ltd	Chocolates	Nairobi
3	Chemelil Sugar Company Ltd	Sugar	Kisumu
4	Coastal Bottlers Ltd	Soft Drinks	Mombasa
5	Bidco Africa Ltd	Edible Cooking fats	Kiambu
6	British American Tobacco Kenya Plc	Cigarettes	Nairobi
7	Broadway Bakery Ltd	Bread	Kiambu
8	Brookside Dairy Ltd	Milk	Nairobi
9	Butali Sugar Mills Ltd	Sugar	Kakamega
10	Crown Beverages LTD	Water	Nakuru
11	Del Monte Kenya Ltd	Fruits packaging	Kiambu
12	DPL Festive Ltd	Containers	Nairobi
13	East African Breweries Ltd	Beer	Nairobi
14	East African Seed Co. Ltd	Quality maize seed	Trans Nzoia
15	Eastern Produce Kenya Ltd (Kakuzi)	Fruit packaging	Embu
16	Equator Bottlers Ltd	Soft Drink	Uasin Gishu
17	Farmers Choice Ltd	Meat Products	Naurobi
18	Githunguri Dairy Farmers Co-operative Society	Milk	Kiambu
19	Highlands Mineral Water Co. Ltd	Water	Nakuru
20	James Finlay Kenya Ltd	Tea	Kericho
21	Kapa Oil Refineries Ltd	Edible oil	Mombasa
22	Kenchic Ltd	Meat products	Nairobi
23	Kenya Seed Company Ltd	Quality seed	Trans Nzoia
24	Kenya Wine Agencies Ltd	Wines	Nairobi
25	Keroche Industries Ltd	Beer	Nakuru
26	Kevian Kenya Ltd	Fruit juice	Kiambu
27	Kibos Sugar and Allied Industries	Sugar	Kisumu
28	Mastermind Tobacco (K) Ltd	Cigarettes	Nairobi
29	Mount Kenya Bottlers Ltd	Soft drinks	Nanyuki
30	Mumias Sugar Co. Ltd	Sugar	Kakamega
31	Nairobi Bottlers Ltd	Soft drinks	Nairobi
32	Nairobi Flour Mills Ltd	Flour	Nairobi
33	Nestle Kenya Ltd	Stimulant drinks	Nairobi

	Company	Main Product	Manufactured Location (County)
34	New Kenya Co-Operative Creameries Ltd	Milk	Nairobi
35	Njoro Canning Factory(Kenya) Ltd	Fruits and vegetables	Nakuru
36	Nzoia Sugar	Sugar	Bungoma
37	Proctor & Allan (E.A.) Ltd	Cereals	Nairobi
38	Pwani Oil Products Ltd	Edible oil products	Mombasa
39	Rift Valley Bottlers Ltd	Soft drinks	Uasin gishu
40	South Nyanza Sugar Company	Sugar	Migori
41	Unga Group	Flour	Nairobi
42	Kenya Orchards	Packed food	Nairobi
43	Carbacid Investments	Carbon Dioxide	Nairobi
44	B O C	Industrial Gases	Nairobi
45	Williamson Tea Kenya	Tea	Kericho
46	Sasini	Agricultural Products	Muranga
47	The Limuru Tea Co. Ltd	Tea	Kiambu
48	Kapchorua Tea	Tea	Nandi
49	Kakuzi	Agricultural	Muranga
50	Eaagads		
51	ARM cement	Cement	Machakos
52	Bamburi Cement	Cement	Mombasa
53	Crown Paints Kenya	Paints	Nairobi
54	East African Cables	Electrical Cables	Nairobi
55	East African Portland Cement	Cement	Machakos

Source: KAM (2018)

Appendix IV: Similarity Index Report

ADVANCED MANUFACTURING TECHNOLOGY AS A STRATEGY IN ENHANCING PERFORMANCE OF LARGE MANUFACTURING COMPANIES IN KENYA

by

Eng. Edward Musebe Achieng
D80/60446/20

Submission date: 14-Oct-2019 12:16PM (UTC+0300)
Submission ID: 1192433343
File name: RESEARCH THESIS 2019 DRAFT 5.doc (1.3M)
Word count: 63132
Character count: 377076

SIGNED……. DATE……

Supervisor,
Prof. Zack B. Awino,
Faculty of Business and Management Science
University of Nairobi.

SIGNED…… DATE……
Dean,
Faculty of Business and Management Science
University of Nairobi

COMPETITIVE ADVANTAGE AND ORGANIZATIONAL RESOURCES: RELATIONSHIP BETWEEN ADVANCED MANUFACTURING TECHNOLOGY AND PERFORMANCE OF LARGE MANUFACTURING COMPANIES IN KENYA

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